Building Note 15

MC0090

Health Building Note 15

Accommodation for pathology services

NHS Estates
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Accommodation for pathology services

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About this publication

The Health Building Note series is intended to give advice on the briefing and design implications of Departmental policy.

These Notes are prepared in consultation with representatives of the National Health Service and appropriate professional bodies. Health Building Notes are aimed at multi-disciplinary teams engaged in:

- Designing new buildings
- Adapting or extending existing buildings

Throughout the series, particular attention is paid to the relationship between the design of a given department and its subsequent management. Since this equation will have important implications for capital and running costs, alternative solutions are sometimes proposed. The intention is to give the reader informed guidance on which to base design decisions.

Health Building Note 15

HBN 15 focuses on District General Hospital accommodation for:

- Chemical pathology department
- Haematology department
- Histopathology department
- Microbiology department

Acknowledgements

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1.0 Scope of Health Building Note 15

Introduction

1.1 This Health Building Note (HBN) gives guidance on the planning and design of comprehensive accommodation for pathology facilities intended to serve a district health authority. It replaces Hospital Building Note 15 — 'Pathology Department', published in May 1962, revised 1973 and then reprinted with amendments in 1981 to take into account the recommendations contained in the 'Code of Practice for the Prevention of Infection in Clinical Laboratories and Post-Mortem Rooms' (HMSO 1978), the "Howie" Code of Practice (superseded by 'Safe working and the prevention of infection in the clinical laboratory' Health Services Advisory Committee (HMSO 1991)).

1.2 Within the health service, the wide range of clinical services and the nature of the demand for pathology investigations (in number and in type) are both reflected in the organisation of the service. This can be classified as:

a. **District pathology services**

For routine investigations, and those more regularly requested special investigations which can be justified both in terms of their workload and the availability of suitably skilled staff and necessary facilities.

b. **Supra-district/regional services**

For less frequently requested and more specialised investigations which may require sophisticated equipment and procedures and particular expertise; and where there is sufficient supra-district or regional demand to make the provision of such facilities more cost effective than providing them in each district.

c. **Special reference work service**

Local factors may exist which will make it desirable for any one district department of pathology to provide a special reference work service for other district departments as a supra-district service.

d. **Joint microbiology/Public Health Laboratory Service**

Some district services will include a joint microbiology and Public Health Laboratory Service department; the latter may often serve a catchment area wider than the district.

e. **Research facilities**

Special laboratory facilities for clinical research are best located within the pathology laboratory complex for ease of collaboration. These facilities should be provided on a planned basis in each region according to requirements.

Inclusions

1.3 This Note gives guidance on the planning and design of accommodation for pathology services providing a laboratory-based diagnostic function for medical practitioners working in or associated with a District General Hospital (DGH). A pathology service which is organised on a district basis will consist of four distinct departments — chemical pathology (clinical chemistry), haematology, histopathology with cytopathology, and microbiology — situated in a single hospital or sub-divided in more than one location. All departments in any one hospital would generally be linked together in one complex so that common services can be shared.

District pathology services

1.4 The recommendations in this Note are intended to provide a comprehensive district service comprising chemical pathology, haematology, histopathology and microbiology.

1.5 These departments would undertake work as follows:

a. **chemical pathology** — general clinical chemistry and special chemical pathology tests for example immunoassay and endocrinology;

b. **haematology** — general haematology, special haematology for example blood coagulation, and blood grouping and cross-matching;

c. **histopathology** — surgical and post-mortem histology (routine and special procedures) and cytopathology;

d. **microbiology** — bacteriology (culture of organisms and serological tests) and some aspects of virology, parasitology and mycology.

Exclusions

Supra-district/regional services

1.6 In general, separate departments of immunology, laboratory genetics, neuropathology, tissue typing, toxicology and virology would be expected to provide supra-district, or possibly regional, services and may be sited in teaching hospitals. Supra-district or regional services might include the following:

a. **Trace elements and toxicology**

It is probable that only a very limited amount of trace element work and toxicology will be undertaken at district pathology departments, the bulk of requests being sent to supra-district or other centres.

b. **Immunology**

Although some aspects of laboratory immunology will be routinely dealt with in most district pathology departments, referral of specimens for specialised tests to supra-district and regional immunology centres is to be expected.

c. **Laboratory genetics**

Clinical cytogenetic services are currently provided on a regional basis. The increasing range of genetic tests is best provided at regional or national level.

d. **Neuropathology**

At present this function is generally carried out in teaching hospitals or regional specialist centres.

e. **Tissue typing**

This function is currently carried out in regional transfusion centres, teaching hospitals and certain other specialised units.

Teaching hospital laboratories

1.7 This Note makes only brief reference to the clinical and educational work of teaching hospital laboratories. It does not describe their design though the principles embodied within these recommendations should apply to them also.

Public Health Laboratory Service

1.8 This Note does not give guidance on the provision of accommodation for the Public Health Laboratory Service (PHLS) requirement which may be integrated with the district pathology services, and which would be project-specific as agreed between the PHLS and health authorities.

Laboratory activities associated with clinical departments

1.9 Guidance is not given in this Note for laboratory facilities which may be located outside the pathology departments, eg ITU, Obstetrics and Neonatal Units, and Out-patient departments.

Mortuary and post-mortem room facilities

1.10 These should be considered along with plans for pathology departments. Guidance is given in HBN 20 – 'Mortuary and post-mortem room'.

Animal houses

1.11 It is not expected that a DGH will require accommodation for experimental animals. However, if a need is identified the size and facilities demanded will vary depending on the type of tests carried out, the type and number of animals used and the availability of facilities in adjacent hospitals or university departments. Close liaison should be maintained in the early design stages with the Home Office inspector who must certify on completion that the animal house accommodation is adequate for its purpose.

Cost allowances

1.12 The cost allowances associated with this HBN were promulgated in an Annex to circular HN(90)21 issued by the Department of Health with the Advance Copy of the Note in September 1990. The areas in Chapter 7 are those used in preparing the cost allowance. They may be used as a guide in preliminary planning, but under no circumstances must they be treated either as a maximum or as an entitlement.

Capricode

1.13 Capricode is the mandatory procedural framework governing the inception, planning, processing and control of individual health building schemes. The aim of Capricode is to provide a consistent and streamlined approach to capital development that achieves best use of resources through the selection and construction of relevant and cost effective schemes that open on time and within budget. It identifies the main activities and provides a framework for delegation with effective management and the proper accounting for expenditure and performance. (See 'Capricode Health Building Procedures' — issued to Health Authorities with HN(86)32; in Wales WHC(86)62).

Equipment

1.14 Equipment is categorised into four groups, as follows:

Group 1: items (including engineering terminal outlets) supplied and fixed within the terms of the building contract;

Group 2: items which have space and/or building construction and/or engineering service requirements and are fixed within the terms of the building contract but supplied under arrangements separate from the building contract;

Group 3: as Group 2 but supplied and fixed (or placed in position) under arrangements separate from the building contract;

Group 4: items supplied under arrangements separate from the building contract, possibly with storage implications but otherwise having no effect on space or engineering service requirements.

Group 1 items are provided for in the cost allowances associated with this Note. The Equipment Cost Allowance Guide (ECAG) specifies a sum of money for the functional unit for Groups 2, 3 and 4.

2.0 General service considerations

Purpose and objectives

2.1 The main objective of a district pathology service is to function as a diagnostic service to meet the needs of clinicians in the hospitals with which it is associated, and the requirements of general practitioners and community health services caring for patients in the district. This service plays a crucial role in the investigation of disease and in facilitating the appropriate treatment and management of patients and in initiating preventive measures.

2.2 The aim of the service is to undertake laboratory investigations, at the request of the clinicians responsible for the patient concerned, on specimens taken from hospital in-patients and out-patients or from patients outside the hospital. The results of the investigations (reports), together with interpretative advice, are returned to the originator of the request or other agreed recipients and are used as an aid to diagnosis, patient management or for population screening, and as useful or essential components of epidemiological studies, control of infection and preventive medicine. (See Figure 1).

Factors influencing planning and trends

2.3 The past decade has seen the following significant developments:

a. Health and Safety legislation reflecting the increased awareness of the need for the protection of both staff and the public against the potential risks associated with the work-place;

b. medical and technological advances which have led to an expansion of clinical specialties and to the associated increased demand on diagnostic services; and also to an increased range and complexity of laboratory tests undertaken;

c. demands on the pathological services which must respond both to the workload and to the pattern of demand generated (eg clinic-related days and times, rapid result response etc);

d. an increase in the range and number of pathology requests initiated by general practitioners. Most laboratories now accept routine specimens from general practitioners in their catchment area.

2.4 Where new pathology department facilities are being planned it is important that the full range of activities required by all users should be considered initially by the Health District Officers. Bearing in mind regional policies, clear strategic and operational policies will need to be formulated. There may be good reasons for excluding certain types of work (for example because they are provided as supra-district/regional services) but the reason for doing so must be justified.

2.5 At the initial option appraisal and planning stages all interested parties should be consulted and involved in evaluating needs and how these can be met. The establishment, at the earliest stage of a project, of a good relationship between the various disciplines and user groups involved will greatly assist with problem solving throughout the whole planning process and thereafter.

2.6 There is a need for early consideration of the clinical aspects of work to be undertaken by pathologists and whether patients would be required to attend for investigation and treatment at the out-patient department or at clinics based in the pathology department complex.

2.7 This Note does not attempt to arrive at a standard solution, but aims to provide a framework of fact and analysis which should help authorities to plan the provision of efficient, safe and economical services in ways appropriate to local needs in a district.

2.8 Local circumstances, a district's population and size, operational conditions including location of users, and constraints (which will include staffing, level of equipment, existing facilities, topography, travel distances and local traffic conditions) will need to be taken account of in the planning of district pathology services and will influence decisions on location of facilities, their size and design. The cost effectiveness and suitability of any proposed outposted pathology facility will need to be assessed.

2.9 The critical response times indicated by clinicians for various laboratory investigations require the pathology service to provide:

a. emergency service on a 24-hour-a-day basis, to effect immediate processing of specimens and to provide prompt feedback of results and advice as necessary. This service is generally provided by local laboratory-based facilities with an out-of-hours emergency service provided by staff on standby or on-call when necessary;

b. results of certain tests urgently though not immediately;

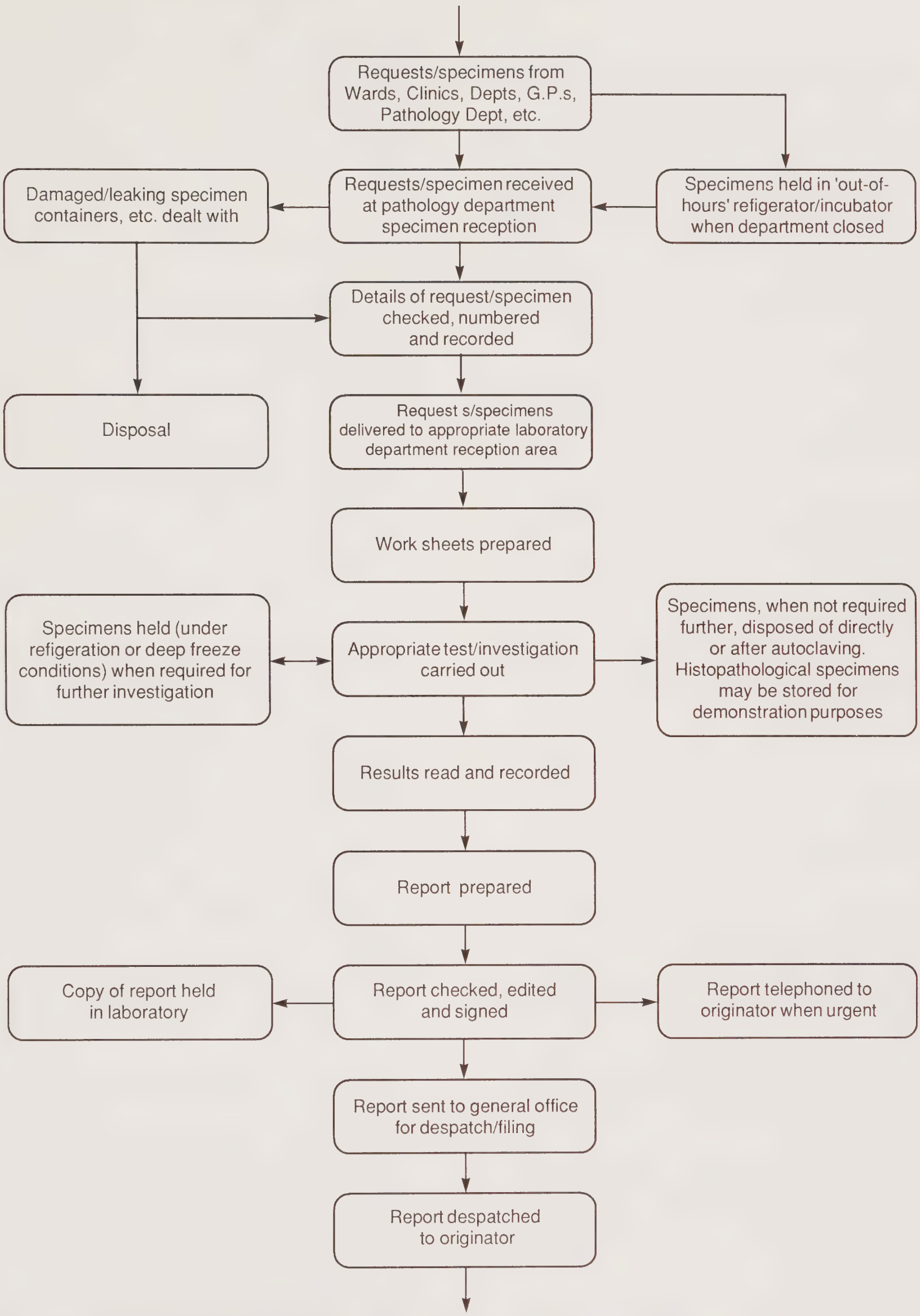

FIGURE 1 - Flow of requests, specimens and reports

c. arrangements for most other requests for laboratory investigation to be dealt with as expeditiously and reliably as possible during normal working hours;

d. arrangements for handling those specimens which need to be despatched elsewhere for investigation.

2.10 The need for an immediate and dependable response from the pathology department arises almost exclusively from acute hospitals providing surgical, medical and obstetric services and is generated by emergencies in which the patient's life may depend upon immediate response by the pathology department.

2.11 These considerations influence the planning of pathology services and their range. Clearly it is imperative that such planning must be coordinated with that of hospital acute services in the district. If it is possible to achieve this by concentrating the main pathology district service facilities in one hospital, economies in space, staff numbers and equipment will result.

2.12 However, satellite facilities may have to be provided elsewhere for the reasons given in paragraph 2.8 and in order to achieve the objectives listed in paragraphs 2.9 and 2.10. Such facilities should remain the responsibility of the main pathology department. The space allocation for the outlying facility will depend on the type of work and the workload handled. The design of the main department will be affected only if the activity in the outlying facility markedly reduces the main laboratory's workload or changes its character.

Possible planning options

2.13 Possible planning options may include:

a. the provision of all pathology services in one location associated with the DGH and serving the needs of the whole district;

b. the provision of pathology accommodation on more than one site, ie the major activities located in the department associated with a main acute hospital services site, and satellite accommodation for an outlying facility(ies) which may be required at other large site(s) with acute hospital services;

c. in a particularly large district, or where topography dictates, there may be justification for two DGHs or for a split-site DGH. Provision of pathology services offering a full routine service at both sites may have to be considered;

d. if an acute hospital generates a workload insufficient to support a viable department and it is possible to arrange efficient, rapid transport of specimens for investigation elsewhere and where this would not be detrimental to patient care, then a transport-dependent pathology service on a site away from an acute hospital may be acceptable.

2.14 Any option appraisal must consider the advantages and disadvantages of the various planning proposals in relation to patient care and include a balanced assessment of all the major factors affecting capital and revenue costs in each case. The viability and cost effectiveness of proposals to establish a smaller pathology facility must be carefully examined.

2.15 Factors to be taken into account when considering the need for a smaller satellite pathology facility include:

a. the importance of delivery of certain specimens to the laboratory without delay to ensure the validity of analytic tests;

b. the necessity for an efficient transport system if specimens are to be analysed at another site;

c. consideration of staff travelling time between departments. (This must not have an adverse affect on the pathology service.);

d. the improved working relations between clinicians, and pathologists and laboratory staff when pathology services are on-site, with more effective use of these services;

e. the importance of maintaining recruitment and morale of staff. This is more easily effected in a main pathology department which performs both routine work and work of a more diverse and specialised nature, thus providing better promotion prospects and recognition of the department as suitable for training. Establishing strong links with the main department and arranging for rotation of staff to, and regular attendance by pathologists at, the outlying hospital from the main hospital could overcome the difficulties of a small pathology department facility;

f. provision for block release, sick and other leave, as these too can seriously reduce the number of staff in a smaller facility;

g. the high cost of providing for efficient transport of specimens to a department located off-site. This must be weighed against the costs of duplication of equipment, accommodation, staff and running costs, and the ability to sustain a viable service with sufficient workload and quality of performance to justify provision of a facility additional to that of the main pathology department;

h. out-of-hours work undertaken at a larger department in the district with the need for medical and technical staff on-call to have access to daytime results of tests done in the smaller department. This may be achieved by efficient computer linkage.

Future trends

2.16 It is important to note that whilst the number of requests is increasing by 3–5 per cent per annum, modern equipment often occupies less floor space than its predecessors. In addition some tests traditionally carried out in laboratories may soon be performed in non-laboratory locations. An increased use of computers for record keeping, monitoring and internal quality control is to be expected. Account must be taken of all these factors in determining space requirements.

Demand for pathology services

2.17 A scrutiny of district health authority population figures and the number of pathology departments to be found in a district reveals no direct relationship between the pathology facilities provided and the population served. However, examination of the number of pathology departments in a district and of workload data (individual requests — derived from SBH6 — 'Pathology Statistical Returns', 1985) reveals that in general where total workload exceeds 400,000 requests per annum, a district is usually served by more than one major hospital and has a major pathology department at more than one site.

2.18 The majority of pathology departments sustain an annual workload of between 100,000 and 400,000 requests. Only a very few departments, namely those in teaching districts or those located in very large hospitals have a workload in excess of 400,000 requests per year. A major proportion of districts serve a population of 100,000 to 300,000. Information on current pathology practice and provision indicates that the basic service facilities detailed in this Note would be capable of sustaining a service to most districts which serve a population of 100,000 to 300,000 and have a workload ranging from about 100,000 to 400,000 requests per year. Where the need for an increase in accommodation is identified, it is related to factors outside the scope of this Note.

Telephone service and data links

2.19 The provision of good communication links - VDTs and telephone systems — within the department is essential to a well-functioning pathology service. These are needed for the recall of recorded results and verbal transmission of information to clinicians and referring hospitals. As the service is mainly an indirect service to patients on a district basis, adequate external as well as internal lines of communication should be provided and vital external links always maintained. Installation of whole hospital electronic telephone exchanges with multi-function facilities obviate the need for a dedicated intercom system and a direct line for the department: (see paragraphs 6.137 and 6.138, and HBN48—'Telephone services').

Shared responsibilities and resources

2.20 Although in the typical arrangement each head of department has independent responsibility, there may be shared responsibilities and resources. Examples include computerised reporting and record keeping; porterage and transport facilities and an equipment cleaning and sterilizing facility. Heads of departments may arrange for these shared services to be the day-to-day responsibility of one of the departments, or of a committee.

Sources of work

2.21 Most of the work coming to a district pathology department is derived from:

a. **Specimens from within the hospital**

   (i) wards;

   (ii) out-patient departments;

   (iii) accident and emergency department;

   (iv) operating theatres and intensive therapy units;

   (v) post-mortem room;

b. **Specimens from outside the hospital**

   (i) general practitioners;

   (ii) community health service clinics;

   (iii) other hospitals and outlying pathology departments;

   (iv) environmental health services;

c. **Patients referred from outside the hospital or from the out-patient department, and hospital staff**

   (i) general practitioners and clinics refer patients direct to a pathologist at the pathology department for clinical advice or treatment;

   (ii) patients may also be required to deliver their own specimens or to provide a specimen on arrival at the pathology department;

   (iii) staff of the hospital and the pathology department itself may be asked to attend for screening tests following an accident where infection is a risk.

3.0 General functional and design requirements

Introduction

3.1 This Chapter provides information applicable to the accommodation for pathology services as a whole on a range of topics which should be taken into account when designing accommodation for the pathology services outlined in Chapter 2. Environment and other topics are considered in Chapter 5. Comprehensive guidance on engineering service requirements is provided in Chapter 6. Full details of activities, equipment, environmental conditions, finishes of walls, floors and ceilings are given in the Activity Data Sheets listed in Chapter 8.

Security

3.2 Good security is an essential consideration because of the serious dangers of exposure of unauthorised persons to a variety of potential hazards in the laboratory, such as biological and chemical. Expensive scientific and technical equipment and other items and materials used in the pathology department are always at risk from attempted thefts. The whole department should be planned as an integrally secure area with all entrances capable of being controlled in accordance with the local Whole Hospital security policy.

3.3 Assaults on hospital staff and theft of NHS property are recognised problems. The project team should discuss security with the officer in charge of the local Police Crime Prevention Department and the hospital or district security officer or adviser at an early stage in the design of the building. Fire and security officers should be consulted concurrently because the demands of security and fire safety may sometimes conflict. The attention of project teams is drawn to the NHS Security Manual issued under cover of HN(84)26; in Wales, WHN(85)1.

3.4 Security arrangements for the department should be compatible with those for the Whole Hospital and should provide for staff safety out-of-hours. The "mastering" of keys and their availability outside normal working hours are matters for local decision.

Safety

3.5 This Note aims to provide guidance on the planning and design of accommodation for pathology services so that work can proceed safely and efficiently at all times in a reasonably practicable manner, provided that clear and sound safety disciplines are understood and adhered to by all staff. The recommended safety measures are directed at reducing risks for staff and the public, which may arise from potential hazards to be found in the pathology department.

3.6 Good laboratory practices advocated in regulations and national codes and guidelines depend on, and dictate, the provision of properly planned and constructed accommodation, designed for the purpose it is intended to serve. The project team should consult with Health and Safety Executive at an early stage of the design and should also refer to relevant publications containing advice to laboratory workers (see Bibliography).

3.7 Hospital pathology departments undertake complex technical work involving several different categories of staff and using a wide variety of scientific methods, materials and equipment. **It is extremely important therefore that users of the department should be consulted from an early stage of the project** in order to arrive at a satisfactory and economical design solution effectively incorporating features to minimise risks from potential hazards. These hazards include:

a. **Physical hazards**

   Accidents and injuries may be associated with the use of sharp instruments; broken glassware; equipment; working in insufficient and badly designed accommodation; slipping on wet floors; moving heavy loads; inadequate storage facilities and cluttered benches and corridors.

b. **Infection hazards**

   Arising from handling potentially infectious specimens of blood, serum, plasma, urine and other body tissues and other excretions. Infection may occur as a result of inhalation, ingestion, inoculation through the skin or splashing into the eyes of infectious agents present in laboratory specimens.

c. **Chemical and gaseous hazards**

   Associated with noxious and/or flammable gases and chemicals (eg fixatives, solvents, reagents, disinfectants) which have to be used in the laboratories during processing of specimens.

d. **Electrical hazards**

   Arising from careless or improper use of electrical equipment, or incorrect or poorly maintained fittings and connections and long trailing leads. These are particularly important in the conditions

often present in laboratories using flammable or corrosive chemicals and frequent use of water.

e. **Radiation hazards**

Ionising radiation from radioactive labelled materials used in some techniques; non-ionising radiation from UV and other wavelength sources (including lasers). Reference should be made to the Ionising Radiations Regulations.

3.8 Table 1 attempts to summarise the identifiable potential hazards which may be encountered in all the departments covered by this Note.

3.9 The design detail of the department and the layout will be important in encouraging the continued use of established safe work practices. Guidance relating to matters where design features can contribute to safety is given in later sections of this Note, for example, on handwashing facilities, environmental conditions, fittings, finishes and furniture; staff facilities which include staff changing and rest-room; storage of chemicals and use of flameproof cabinets. Special equipment such as exhaust protective cabinets and fume cupboards will be required. Guidance contained in Chapters 4, 5 and 6 should be taken into account: see also fire precautions in paragraphs 5.13-5.16.

3.10 Provision should be made for the storage of and ready access to first-aid needs, chemical poisoning antidotes and eye-care items (see paragraph 4.44). These should be sited at strategic positions within the pathology department.

Emergency shower

3.11 A showerhead in a lobby or corridor should be provided adjacent to the work areas where there is a risk of severe chemical contamination. This will be for emergency purposes only with an immediate high volume output. Floor drainage needs to be provided.

Infection control

3.12 Reference should be made to the first report of the Advisory Committee on Dangerous Pathogens (ACDP) entitled 'Categorisation of Pathogens according to Hazard and Categories of Containment' (ACDP 1984). This shows that Containment levels 2 and 3 are appropriate for clinical laboratories.

3.13 For all laboratory accommodation in clinical pathology departments in which routine work on specimens is conducted Containment level 2 is the minimum.

3.14 In microbiology departments a separate Containment level 3 laboratory will be required for work on Hazard group 3 organisms and specimens which might contain them. The other departments will from time to time require access to Containment level 3 accommodation as need arises. In constructing a Containment level 3 laboratory, it is important to remember that the need may arise for fumigation of the room — generally with formaldehyde. Where suspended ceilings are installed the design should not permit the fumigant to disperse to other areas through the void above. In order to clear the room of formaldehyde vapour to a safe level after fumigation is complete, it may be useful to arrange for the microbiological safety cabinet sited in the room to be controlled from outside the room as well as from the cabinet itself.

3.15 Basic rules for infection control of work in each of the four major departments were specified in the 'Code of Practice for the Prevention of Infection in Clinical Laboratories and Post-mortem Rooms', DHSS, 1978 (the Howie Code)* and the Health and Safety Advisory Committee's publications on "Hepatitis B" and the "Labelling and Transport of Specimens".

Hepatitis and AIDS (HIV formerly LAV/HTLV III)

3.16 These two diseases have gained particular prominence in recent years and the conditions appropriate for controlling the risks of infection in the laboratory have now been defined. Work on specimens known or suspected to contain these agents is to be conducted in laboratory accommodation at not less than Containment level 2, at a secluded bench/bay/workstation. Containment level 3 is only required where these viruses are to be propagated or concentrated. Details of the operational procedures and alternative sites for this work (ie separate room or secluded space within a larger working laboratory) are to be found in the Health and Safety Advisory Committee's publication on "Hepatitis" and the Advisory Committee on Dangerous Pathogens' guidelines on "AIDS".

Formalin (formaldehyde)

3.17 A solution of formaldehyde gas in water (formalin) is used in some quantity in a histopathology department for the fixation of tissues. Intermittant exhaust ventilation

*Superseded by 'Safe working and the prevention of infection in the clinical laboratory' and 'Safe working and the prevention of infection in the mortuary and post-mortem room', HMSO. 1991

Table 1
Potential hazards in pathology departments

		Haematology and blood transfusion	Histopath. and cytology,	Micro-biology	Clincial chemistry	Secure storage	Fireproof storage	Physical containment
Chemical	- "toxic" (1)	+	+	+	+	✓	-	
	- corrosive	+/-	+/-	+/-	+	✓		
	- carcinogenic	-	+	+/-	+/-	✓		✓(9)
	- reactive	+/-	+/-	+	+	✓		
	- acute poisons, DD	+/-	+/-	+/-	+/-	✓		
Formalin		-	++	-	-	✓	-	✓(7)
Flammable solvents		+	++	+	+	✓	✓	✓(9)
Infection risks		+	+	+	+	✓(13)	-	✓(8)
Compressed gases								
	- flammable	-	-	+/-	++	✓	-	-
	- non-flammable	-	+/-	+	+	✓	-	-
Electrical	- mains voltage	+	+	+	++			✓(10)
	- high voltage	-	-	-	+			
Radiation	- sealed sources	+/-(2)	-	-(2,3)	+/-(2)			✓
	- unsealed sources	+/-(4,11)	-	+/-(4,11)	+(11)	✓	-	✓(11)
	- non-ionising(12)	+	-	+/-	+			
Mechanical	- static loads	-	+(5)	-	-			
	- moving machinery	-	+(6)	+/-	+/-			
Steam under pressure		-	-	+	-			
Waste	- "toxic"	+/-	+	+/-	+	✓		
	- flammable	+/-	++	+/-	+	✓	✓	
	- infectious	+	+	++	+	✓		
	- sharps	+	+	+	+	✓		

✓ Requirement +/- Occasional hazard + Frequent hazard ++ Very frequent hazard

Notes.
1. "Toxic" in this context means substances which are poisonous in the broadest sense but not recognised acute poisons or dangerous drugs
2. The sealed source is the reference built into radioactivity counters and GLCs
3. An electron microscope may be described as sealed source. The electron microscope is however unlikely in a DGH although some PHLS laboratories have them
4. Radioimmunoassay is to an extent used in haematology and microbiology, although it is declining
5. Slide storage represents a heavy load on floors
6. Microtomes with associated blades/knives
7. Cutting-up bench with exhaust ventilation
8. Containment levels 2 and 3, microbiological safety cabinets
9. Fume cupboards as necessary
10. Isolator
11. Room/area set aside for handling radioactive materials
12. Lasers in analytical equipment and UV lights
13. Control organisms e.g. Corynebacterium diphtheria

will be required at the cutting-up bench where the fixed tissues are examined (see paragraphs 6.65-6.69). Similarly specimen stores containing formalin-fixed tissues should be continuously ventilated to avoid the build-up of unacceptable concentrations of the released gas and its spread into the working environment. Exhaust ventilation is also required for waste disposal units used for the disposal of "fixed" specimens. Formalin solution make-up and dispensing areas also need careful consideration.

3.18 A number of options exist for providing the required level of exhaust, including the use of purpose built workstations designed specifically for this work. Whatever solution is adopted particular attention should be paid to where the air extracted from the cutting-up bench is vented so that it does not re-enter the building or adjacent buildings: see HSE Guidance Note EH40.

Fire and chemical hazards in the laboratory

3.19 The standard advice on fire hazards and prevention in all health buildings is to be found in paragraph 5.13. Reference should also be made to the FIRECODE suite of documents. Fire risks in the laboratory do, however, merit some special mention as the necessary presence of quantities of infectious materials, flammable solvents and gases and other reactive chemicals creates a special hazard not generally encountered in other departments of the hospital. Electrical fires are another potential problem due to the large amount of powered equipment in use in the laboratory. Reference should be made to FPN6 — 'Laboratories' (in preparation).

3.20 Extinguishers (for both electrical and chemical based fires) should be strategically placed near to solvent stores, fume cupboards and at other key points throughout the laboratory. Fire blankets may also be necessary.

Waste disposal

3.21 Secure holding storage spaces are necessary for several categories of laboratory waste awaiting treatment or disposal. The 'Safe Disposal of Clinical Waste' (HSAC 1982) provides a basic reference for waste categorisation. Clinical waste disposal should be in accordance with the DOE's Waste Management Paper No 25. Operational practices in relation to infection control are also defined in the 'Code of Practice for the Prevention of Infection in Clinical Laboratories and Post-morten Rooms', DHSS 1978* (see also paragraph 6.116).

Warning notices

3.22 As stipulated by report No 1 of the Advisory Committee on Dangerous Pathogens a warning notice **"Danger of infection"** with the international Biohazard symbol must be clearly displayed on the doors of all rooms which are used for work with Hazard group 3 organisms. Reference should be made to HTM 65—'Signs', and The Safety Sign Regulations 1980, SI 1980 No 1471.

3.23 Exhaust ducting from microbiological safety cabinets must display the international Biohazard symbol so that it is clearly visible to maintenance staff. Additional notices should be displayed where considered necessary (see also paragraph 5.28).

Location

3.24 The location of a pathology department within a hospital requires careful consideration in order to satisfy the need that the department be in a position that is readily accessible to both patients and to other hospital departments. However, account must be taken of constraints arising from safety considerations and allowance made for possible growth or change. The project team will also need to consider the public health protection aspects when deciding on the location within a particular hospital.

3.25 The following factors should be borne in mind when considering the location of a pathology department (see Figure 2):

a. it should be easily accessible from the out-patients', accident and emergency, and maternity departments; surgical wards; operating theatres; and the intensive therapy unit. Medical wards and other clinical departments should also be within easy reach of these diagnostic facilities;

b. there should be a close link with the main hospital routes for easy distribution of laboratory specimen containers, reports, and blood to the wards and other hospital departments; and ease of transport of specimens from these to the pathology department; and to allow accessibility for medical and other hospital staff;

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*Superseded by 'Safe working and the prevention of infection in the clincal laboratory' and 'Safe working and the prevention of infection in the mortuary and post-mortem room', HMSO. 1991

c. the function of the hospital mortuary is closely linked with that of the pathology department - in particular, histopathology department activities and personnel - and it should be easily accessible to pathology staff: for further details see HBN 20— 'Mortuary and post-mortem room';

d. paragraph 3.2 recommended that the whole department should be planned as an integrally secure area. In particular, the total number of entrances from the exterior should be minimal, to deter unauthorised access. In addition, there should be no corridor traversing the department which could be used as a link between other departments or constitute a fire escape route except for the users of the department;

e. the receipt of bulk deliveries of laboratory supplies and large items of equipment may influence planning decisions on the size and position of lifts, hoists, corridors and doors;

f. laboratory areas are considered to be potential sources of infection and high fire-risk areas. For these and for aesthetic reasons, proximity to staff accommodation and to those areas frequented by the public is inadvisable;

g. good access must be available for fire brigade vehicles;

h. exhausts from ventilation systems servicing the pathology department must be discharged safely to avoid ingestion by neighbouring supply ventilation systems or entry into ajacent windows of naturally ventilated spaces;

j. convenient access will be required to an incinerator for the safe disposal of laboratory waste;

k. easy access to external stores of gases and flammable materials is essential.

Design considerations for growth and change

3.26 In the design of pathology departments consideration should be given to the need to allow for growth and change, irrespective of the scale of work and scientific discipline involved. Unlike research and "teaching" laboratories however, routine health service diagnostic facilities are not generally subject to rapidly changing requirements or multi-disciplinary use of laboratory space which need a high degree of adaptability. Nevertheless, their requirements will undoubtedly change to some extent during the life of the building.

3.27 The terms "flexibility" and "adaptability" are commonly used in a loose interchangeable way to imply that the accommodation allows a degree of responsiveness to changing user needs. The following definitions for these terms will perhaps help to clarify the different emphasis in the approaches to design that can be developed to meet both initial and future requirements:

a. **Flexibility**

   Enables different activities to be accommodated in given spaces without physical rearrangement taking place;

b. **Adaptability**

   Refers to the design of a building which allows physical rearrangement of building elements, services and furniture.

3.28 With a flexible design an assessment is made at the design stage of the widest range of work that may take place in the foreseeable future, and a generalised — but fixed — arrangement is made. New needs and organisational changes are met by moving people and their equipment rather than by physical alteration of the layout.

3.29 An adaptable design allows tailored accommodation for each changing need by making physical adjustment of the facilities. The way in which this is done will vary depending upon how easy it is to make the adjustment.

3.30 Thus, in order not to be constrained by initial requirements, it is necessary to incorporate within the design various methods that enable flexibility and/or adaptability to take place. These include:

a. the provision of laboratories on a modular repetitive bay, each unit having a standard pattern of benches and services;

b. the provision of service outlets in a regular grid or pattern with service runs in floor ducts, above the ceiling or in vertical ducts, so that any work position is able to make use of the full range of services provided;

c. the use of removable partitions between laboratory spaces;

d. the provision of laboratory furniture designed so that it may be added to, subtracted from, or rearranged as required.

3.31 The extent to which the foregoing provisions are incorporated should be carefully considered at the design stage: as stated before, the requirements of routine health service diagnostic facilities do not need the high degree of adaptability that some other types of laboratory accommodation require. Thus a compromise should be

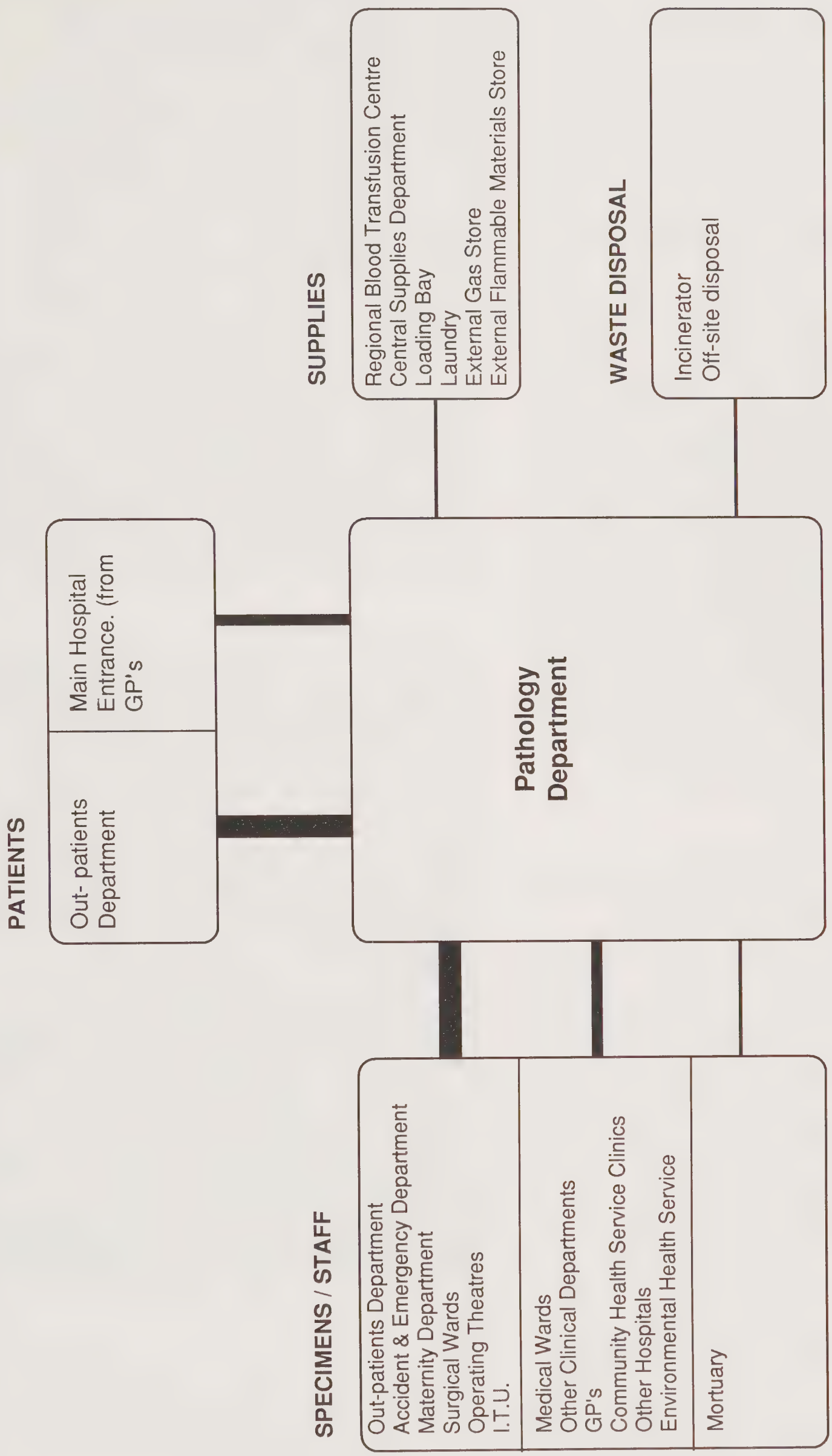


FIGURE 2 - Traffic density between a District Pathology Department & other Hospital Department/Off site facilities

Relative traffic density denoted by thickness of line

sought which will provide the amount of flexibility/ adaptability considered necessary for the type of laboratory accommodation being designed, but will avoid over-provision which results in unnecessary expenditure and, frequently, inconvenience in the use of the work space. It should be borne in mind that, whatever type of design solution is adopted, safety considerations are paramount.

Internal environmental considerations

3.32 Good interior design can contribute to staff morale and the aim should be to create a pleasant, comfortable and safe environment throughout the department within the constraints of laboratory requirements. Natural lighting should be provided to all laboratory work areas which are occupied for any length of time; natural ventilation should also be provided whenever laboratory considerations permit. It is important to ensure that normal air temperature is maintained and that draught-free ventilation is provided. Discomfort on the part of staff may well lead to an unsafe condition. Natural lighting and ventilation are of particular importance in such areas as the staff room, offices and patients' accommodation.

Natural and artificial lighting

3.33 Orientation is an important consideration in the siting of any new development. Sunlight enhances colour and shape and helps to make a room bright and cheerful. Glare and solar gain may be controlled by blinds or in non-laboratory areas, by curtains.

3.34 Natural lighting is important for examination of culture plates in the microbiology department. North light is preferred for this purpose.

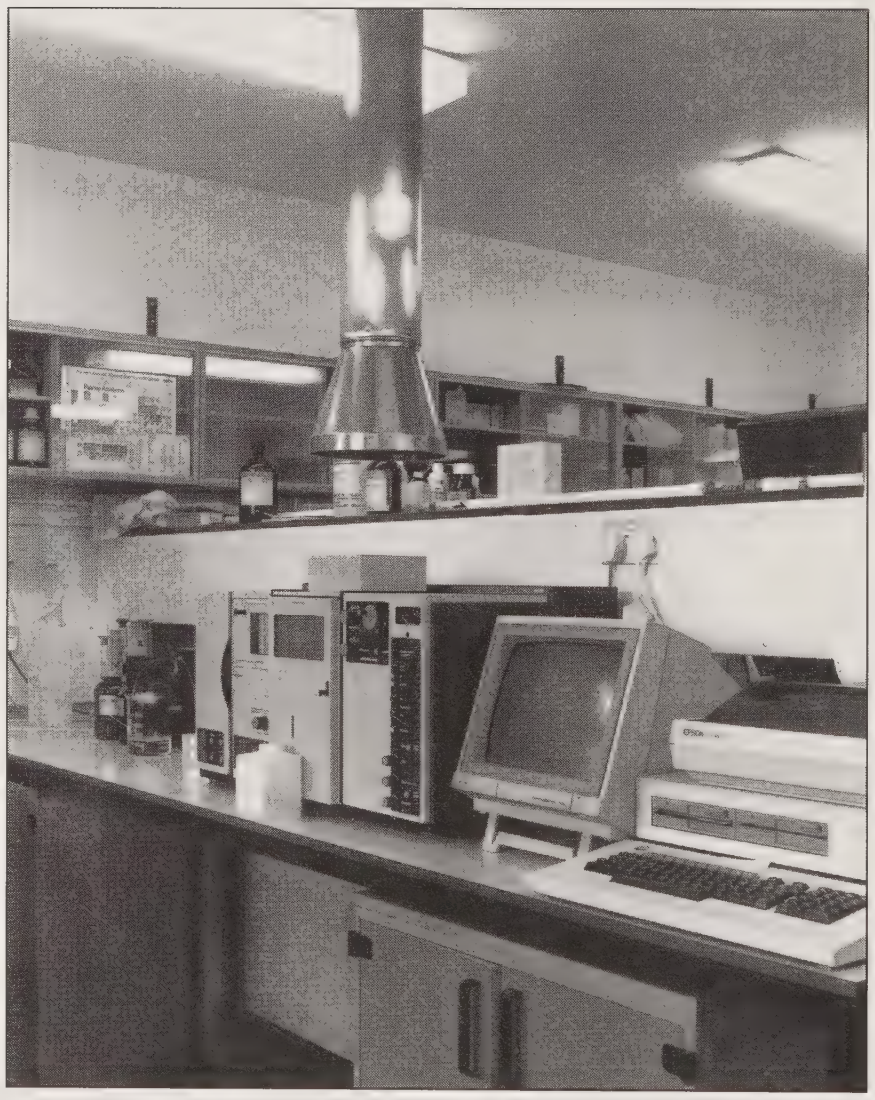
Windows

3.35 In addition to the various statutory requirements, the requirements for safety, ventilation and illumination, insulation against noise, thermal loss or solar gain, energy conservation, the prevention of glare and the provision of a visual link with the outside world, all need to be taken into consideration. Requirements for cleaning the inside and outside of windows should not be overlooked. The need for privacy must be considered where work areas such as patient areas and the cutting-up area in the histopathology department may be overlooked by adjacent buildings.

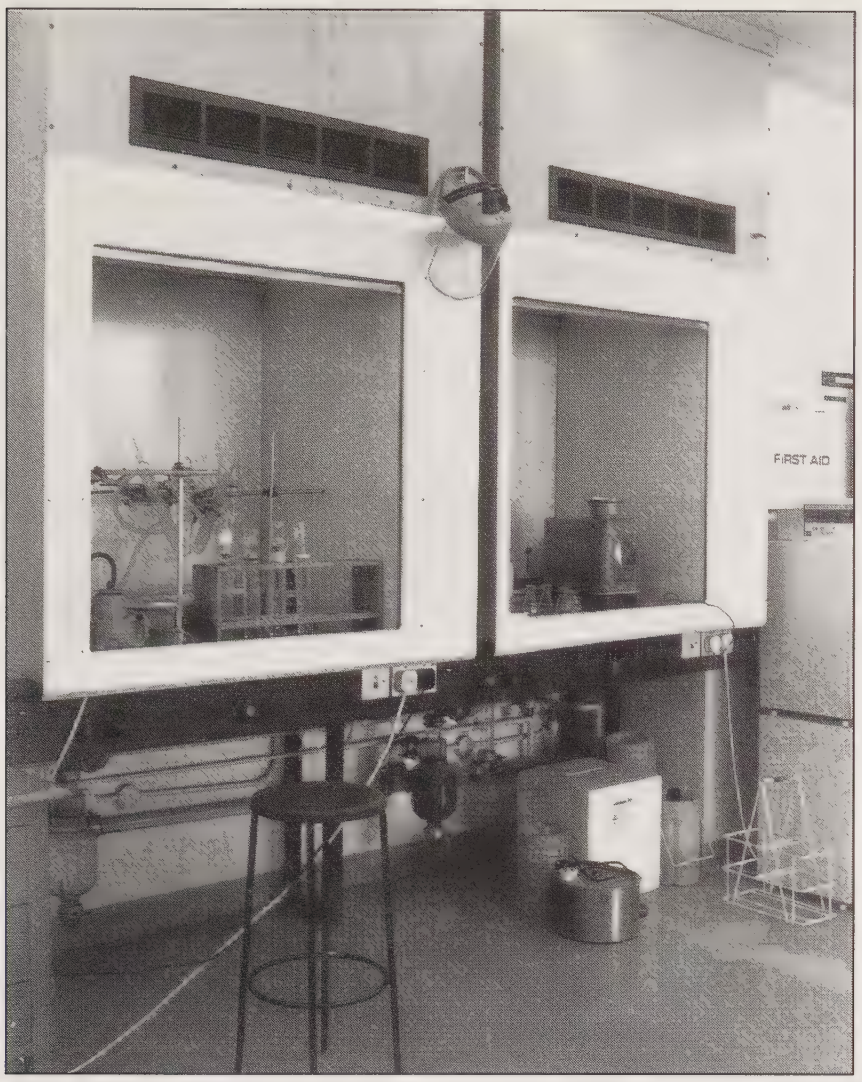
Ventilation — natural and mechanical

3.36 Natural ventilation is usually caused by the effect of wind pressure. It will also occur to some extent if there is a temperature difference between inside and outside the building. This thermo-convective effect frequently predominates when the wind speed is low. Ventilation induced by wind pressure can promote high air change rates through a building if air is able to move freely within the space from windward to the leeward side of the building. Internal partitions, fire compartment walls and closed doorways can however often impede the flow path, then ventilation becomes, in effect, singlesided. Nevertheless, even with this degree of obstruction, acceptable ventilation may still be obtained without excessive window openings which could prejudice safety, security and comfort. Some types of windows, for example vertical sliding, can enhance single-sided air exchange by temperature difference, and these will improve the overall rate of natural ventilation in protected or sheltered areas where the effect of wind is likely to be minimal. BS5925 — 'A code of practice for Design of Buildings' provides guidance on this subject.

3.37 Some laboratory equipment has a high heat output and consideration must be given to cooling areas where this type of equipment will be located. Provision must also be made for the safe removal of smells, noxious and/or flammable fumes and the exhausts from microbiological safety cabinets.



Local fume exhaust



Fume cupboard

Internal spaces

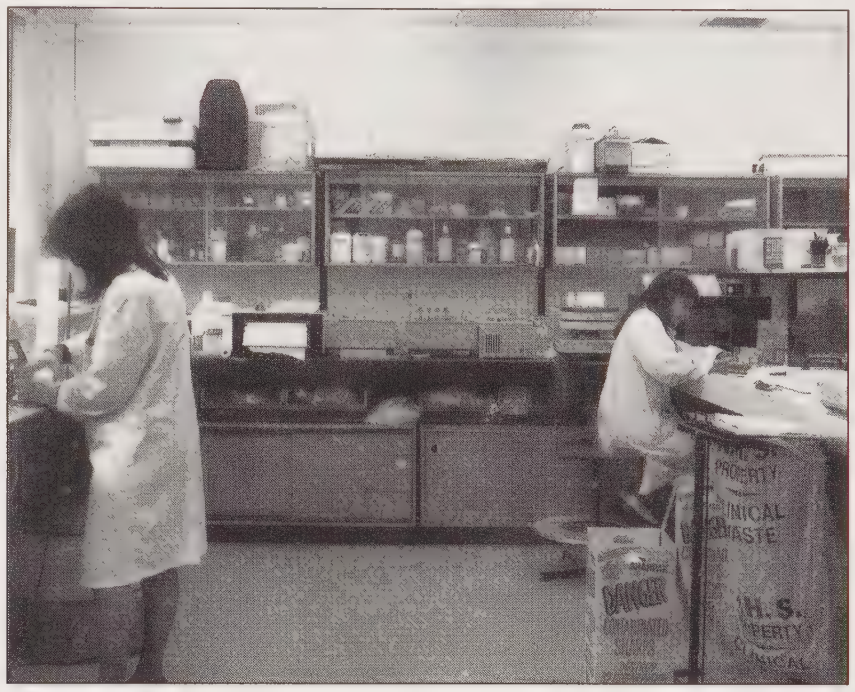
3.38 Internal rooms may contribute to economy in planning but the resulting continuous need for artificial lighting and mechanical ventilation will add to both capital and running costs. Such rooms do not provide good working conditions and hence should be used only for activities of infrequent or intermittent occurrence or which demand a controlled environment. Rooms that are likely to be occupied for any length of time by staff or patients should have windows.

Finishes, fittings and equipment

3.39 Designers should aim to create an interior which is comfortable and pleasant to look at and promotes safe working practice. The choice of finishes will be influenced by the activities in individual areas. Cleaning and disinfection regimes should be considered when materials are selected.

3.40 The selection of fittings and furniture should form an integral part of the design process and should be co-ordinated within the overall design scheme (see paragraph 5.18). Fittings should be designed to minimise inaccessible areas in which dust or organisms can accummulate. Fittings and furniture should be made of durable materials which will not deteriorate under continuous hard use. They should be designed for ease of cleaning and be free from sharp corners or projections to avoid the risk of injury to users. All fittings should be of ergonomically correct design for reach and height; all sinks and taps in the laboratory should be appropriate for the intended use.

3.41 In the laboratory areas the need is for hard-wearing, easily cleanable, impervious surfaces, resistant to stain and damage by chemical action and wall surfaces which are impermeable and washable. The colour of work surfaces should provide a suitable background without creating any problems of glare. (For further information see HTM 67— 'Laboratory Equipment' - in preparation.)



Typical benching bay

Flooring

3.42 It is important to select a floor covering which is appropriate to the functional use and which contributes towards the creation of an attractive environment, but which does not present a hazard to disabled people or the movement of wheeled equipment. It is important that the floor covering chosen can be effectively cleaned, maintained and, where necessary, repaired. It should also be resistant to the effects of disinfectants and reagents in common use. Rapid developments in soft floor covering technology have produced a wide variety of new materials. Floors should not present, or appear to present, a slip hazard and the patterning should not produce disorientation. There is a specific problem in the histopathology department due to wax spillage and the use of non-slip materials and/or measures is essential. Changes of floor level should be avoided wherever possible. Surface drag, static electricity, flammability, and infection hazards are other factors which need to be considered. (See also "Maintenance and cleaning" — paragraph 5.24.)

4.0 Specific functional requirements

Introduction

4.1 This Chapter describes the individual space requirements for a pathology department (see Figure 3). It outlines the accommodation and services within a pathology department complex as follows:

a. facilities which are shared between the four departments comprising the pathology department;

b. facilities which are required by each department;

c. a facility which is required in some departments;

d. facilities required by the Chemical Pathology department;

e. facilities required by the Haematology department;

f. facilities required by the Histopathology department;

g. facilities required by the Microbiology department.

4.2 Details of the accommodation required and the desired siting relationships are given as an aid to determining the layouts for individual departments and the pathology department complex as a whole.

Facilities shared between the four departments

4.3 These have been grouped and described under the following headings:

a. patient areas;

b. specimen reception area/"out-of-hours" facility;

c. working areas;

d. staff facilities.

Patient areas

4.4 The patient areas must be separate from all laboratory working areas. They should be adjacent to the haematology and chemical pathology departments and readily accessible from the microbiology department. The location and layout of the patient areas must be such as to preclude unauthorised access to other areas of the laboratory complex. Clear signposting and careful attention to the need for designing a layout which safely separates the functions and usage of patient reception from the specimen reception area is necessary.

Main entrance, patient reception and waiting

4.5 The main entrance for patients visiting the pathology department complex will be combined with the patient reception and waiting areas. After reporting to the reception point patients will wait until called to the adjacent consulting/examination/venepuncture rooms.

4.6 Waiting space will be required for up to 20 patients, or up to 40 patients if local arrangements allow for clinics to be undertaken in the pathology department complex. Comfortable seating and low tables should be provided. Special attention should be paid to the finishes and furnishings to create a calm, reassuring atmosphere for patients (see paragraph 5.27 — "Disabled people").

Patient waiting area

4.7 The reception point should provide space for two staff members at peak periods. A counter and hatch will be required and should overlook the waiting area.

Consulting/Examination/Venepuncture rooms

4.8 The necessity, size, and allocation of rooms for this purpose will depend on local policy concerning the services provided at the pathology department and the out-patients department. For some tests patients are required to attend at the pathology department itself. A proportion of patients attending as out-patients will require rapid results on laboratory investigations for diagnosis or treatment and others will merely require blood specimens to be taken for subsequent testing. Patients may also be referred to the hospital by general practitioners for their blood and other specimens to be obtained for investigation. Additionally, pathologists may undertake direct investigation/treatment of patients.

Microbiology
General laboratory
Containment level III laboratory
Bacterial & viral diagnostic serology & antibiotic laboratory
Blood culture laboratory
Media preparation
Media/plate pouring
Hot room
Cold room
Consultant's, Junior medical staff's.
Head M.L.S.O.'s offices
Secretarial office
Laboratory store

Chemical pathology
Specimen reception/preparation & preliminary processing laboratory
General laboratory
Special tests laboratory
Chemical storage/weighing/reagent-solution preparation area
Cold room
Consultant's, Junior medical/scientific staff's
Head M.L.S.O.'s offices
Secretarial office
Laboratory store

Shared accommodation

Patient areas
Main waiting
Main reception
Consulting/examination room(s)
Venepuncture room(s)
Patient's w.c./specimen w.c.

Specimen reception areas
Specimen reception
Out of hours facility

Work areas
General office
Computer room
Office of pathology common services co-ordinator
Secretarial office (project option)
Bulk store/storekeeper's office
External flammable materials/gas store
Autoclave area
Central wash-up
Minor equipment maintenance area
Disposal holding room
Cleaner's room

Staff facilities
Staff change/w.c./shower
Staff room
Technical library/seminar room
Duty staff bedrooms/w.c./shower

Histopathology
Gross-cutting, specimen processing/specimen storage room
General laboratory
Special tests laboratory
Chemical store/preparation area
Slide & block store
Consultant's Junior medical staff's,
Head M.L.S.O.'S offices
Secretarial office
Laboratory store

Cytopathology
Processing laboratory
Screening laboratory

Haematology
General laboratory
Special tests laboratory
Cold room
Consultant's, Junior medical staff's
Head M.L.S.O.'s offices
Secretarial office
Laboratory store

Blood transfusion
Reception
Blood grouping laboratory
Blood cross-matching laboratory
Head M.L.S.O.'s office

FIGURE 3 - Elements of a District Pathology Department

4.9 Basic facilities will therefore be required both in the pathology department and in the out-patients department. Additional provision to meet the total need for venepuncture and consulting/examination rooms will have to be in accordance with local policy for providing the service needs described above.

4.10 Consulting/examination/venepuncture rooms should be adjacent to the waiting area. Facilities will be required for venepuncture and minor procedures for obtaining specimens from patients. There should be space for the patient to dress and undress, with assistance if necessary, and in privacy. Provision should be made for holding small stocks of specimen-taking apparatus and specimen containers, the disposal of waste material and storage of protective clothing. A desk and chair will be required for the pathologist and chairs should be provided for use by a patient and any relative/escort accompanying the patient. Space should be sufficient for use by wheelchair patients, or mothers with prams. Reference should be made to HBN 40—'Common Activity Spaces Volume 1'. Handwashing facilities must be readily available.

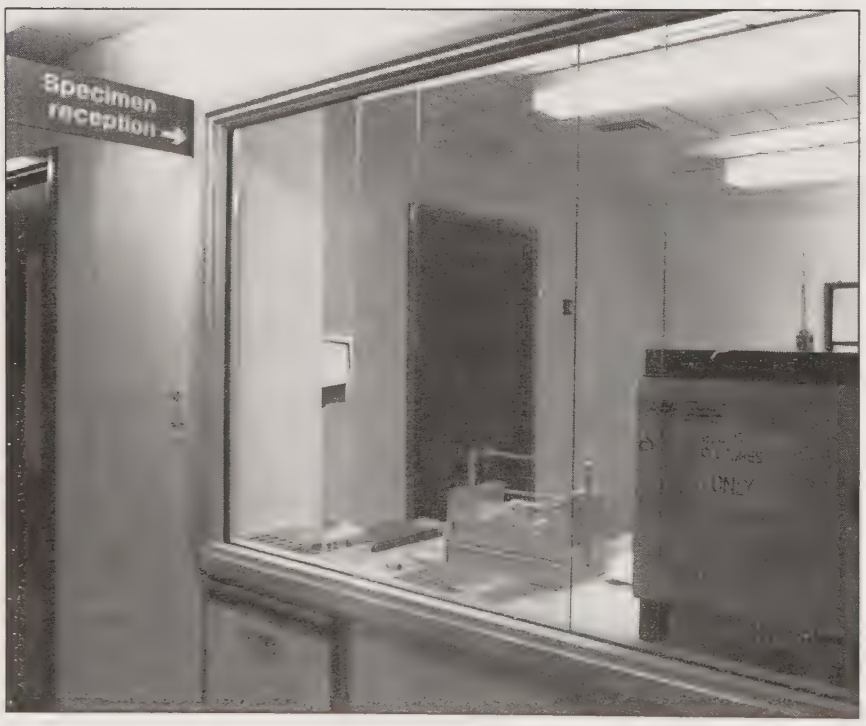
Patients' WCs

4.11 WCs for patients, including one for disabled persons and also with facilities for specimen collection, will be required adjacent to the waiting area.

Specimen reception

4.12 Normally the bulk of specimens from inside and outside the hospital will be received at a main specimen reception point serving the pathology department. From here they would be distributed to the appropriate departmental reception areas (see Figure 4).

4.13 The reception point for specimens must be separate from the patient reception point and should not be part of a clerical office or in a public corridor.



Specimen reception

4.14 Specimens should be delivered across a fixed counter (with a hatch) having smooth impervious surfaces resistant to any damaging effects of disinfectants.

4.15 The working side should not be carpeted and should have handwashing facilities. Storage for protective clothing and for specimen trays will be required. (See HSAC document – 'Labelling, Transport and Reception of Specimens'.)

Out-of-hours facility

4.16 Provision is required for access to cross-matched blood and for holding specimens and blood cultures taken outside normal working hours at 4°C, at room temperature and at 37°C. This facility should be accessible without the need for entry into the laboratory areas.

Working areas

4.17 The general office function and patient reception can best be administered effectively when carried out in contiguous areas which must be separate from all laboratory working areas (see Figure 4).

General office administration and records

4.18 Normally all reports of pathological examinations will be despatched through one central point (the general office) serving the whole pathology department. Reports received from individual departments may be copied and stored in the general office which will normally maintain a district records section. There should be sufficient space for up to four members of staff to work at peak periods. Current reports may be kept in accordance with HC(89)20. The methods of handling and storing reports are changing with the wider introduction of automatic data processing systems.

Stores - bulk supplies

4.19 Bulk supplies and small items of equipment for each department will be held in a central lockable laboratory store within the laboratory complex. Mobile racking maximises the available space. Space will be needed for storekeeping activities.

4.20 A separate area within the main store will be required for non-flammable laboratory chemicals, including provision of a poisons cabinet if appropriate.

External gas store

4.21 Even when piped supplies of frequently-used gases are available an external weatherproof store will be required for the range of gases supplied by cylinders. The 'Code of Practice for the Storage of Medical, Pathology and Industrial Gases Cylinders', WKO(85)1 dated February

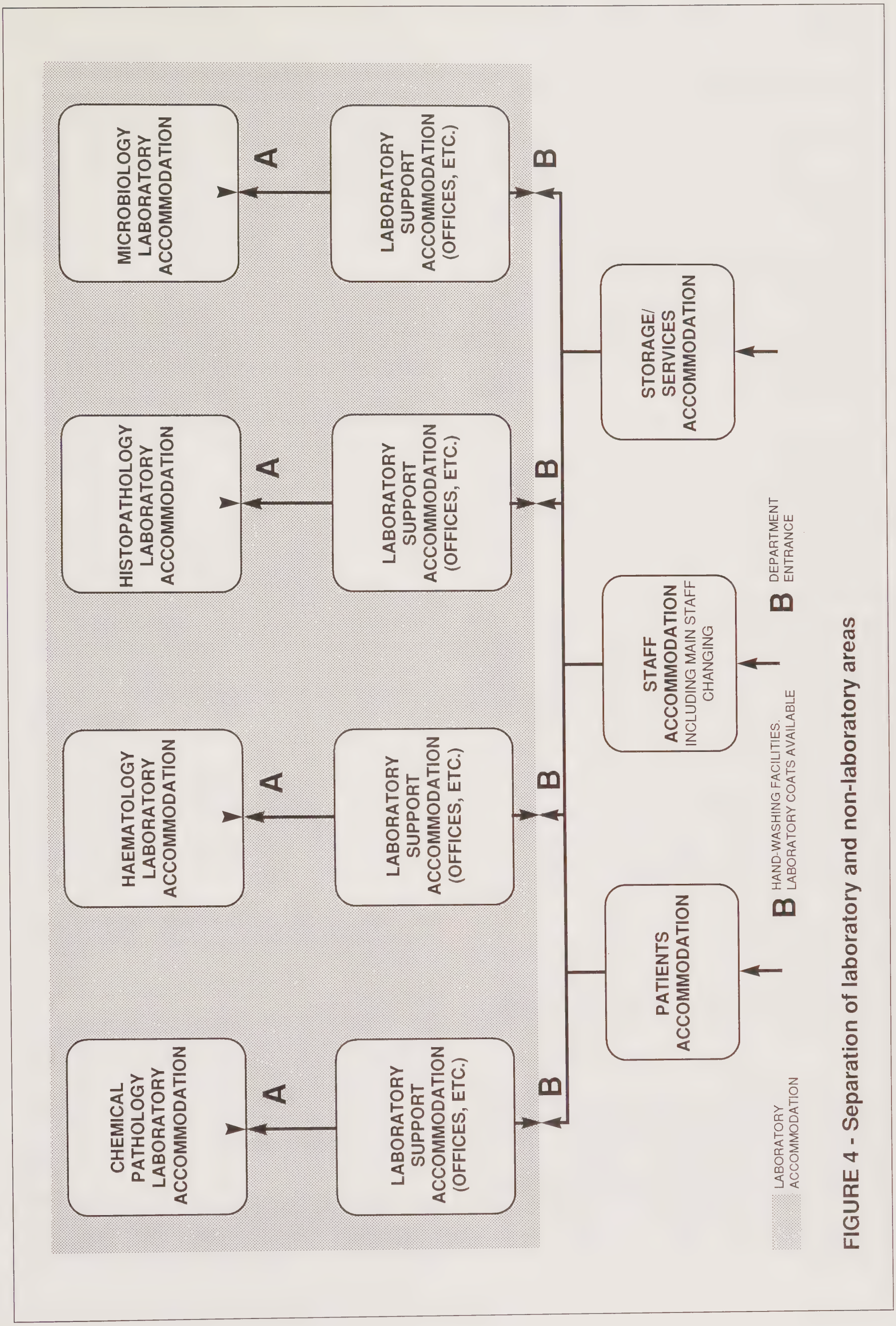


FIGURE 4 - Separation of laboratory and non-laboratory areas

1985, gives guidance on the siting, design, construction and layout of cylinder stores.

External flammable goods store

4.22 The main stock of highly flammable materials used in pathology laboratories should be stored in a secure external flammable goods store which is easily accessible from the laboratories. It may usefully be grouped with other flammable goods stores in order to share vehicle access. Local policy may require the storage of flammable goods to be the responsibility of the pharmaceutical department. Supplies of flammable liquids may conveniently be held in the pharmacy flammable store. However day-to-day supplies of flammable liquids will need to be stored in flameproof cabinets in each laboratory area. Advice on the storage of flammable materials is contained in Firecode – 'Fire Practice Note 2 Storage of flammable liquids'.

Minor equipment maintenance area

4.23 A maintenance area should be provided where minor maintenance work on smaller pieces of equipment can be done. This area would also serve to hold equipment prior to removal elsewhere for major repair — see HC(87)22.

Disposal/Holding facilities

4.24 Facilities for the temporary holding of securely packed refuse and linen bags (appropriately colour-coded) should be provided. Disposal of laboratory waste materials will depend on Whole Hospital policy but should be in accord with the Health Services Advisory Committee and Health and Safety Commission's document on 'The Safe Disposal of Clinical Waste'.

4.25 If the pathology department is located on two floors, these facilities will need to be duplicated. Ease of access to the autoclaves located in the pathology department complex and to an external transport route is essential.

Cleaners' room

4.26 The cleaners' room is the base from which domestic services staff provide a cleaning service to the pathology department. When the department is located on more than one floor, each floor should have a cleaners' room.

4.27 There should be easy access to cleaning equipment and materials, and adequate space for manoeuvring machines, emptying and filling of buckets, and the routine servicing and cleaning of equipment. There should be unrestricted access to the sink – which should have hot and cold water – and to a wash-hand basin. The room should be well lit, and ventilated so that equipment can dry quickly.

Computer room

4.28 A room will be required for computer facilities which are associated with linked equipment for administrative functions. Provision should be made for storage of manuals, paper and discs and a fire-proof safe outside the main room. Space will be needed for the computer, printer and other equipment. Desk facilities will also be required. The room should be easily accessible to the general office, administration and records - see paragraph 4.18. Reference should be made to paragraphs 5.19-5.21 on Information Technology.

Staff facilities

Staff changing and WCs

4.29 Separate staff changing areas will be required for male and female staff. Full-length lockers for holding outdoor clothing and personal valuables under secure storage should be provided on a personal basis. Provision is also required for handwashing, showering and grooming.

4.30 Clean protective clothing/white coats will be issued from a clean linen store sited adjacent to the changing facilities. Protective clothing should be removed before staff leave the laboratory working areas. Coat hooks should be provided near handwashing facilities at the exit of each laboratory. Dirty protective clothing will be discarded into linen bags (appropriately colour-coded) housed in a small bay, off circulation and adjacent to the changing areas. Laboratory garments will need to be treated and laundered in accordance with the policy for laundering soiled and/or potentially contaminated linen: see HC(87)30. Garments used for work in the Containment level 3 laboratory will need to be decontaminated (autoclaved) prior to being deposited in the colour-coded laundry bags.

4.31 Staff WCs with handwashing facilities should be provided adjacent to the changing rooms, and elsewhere as appropriate.

Staff room

4.32 A staff room will be required sited appropriately to serve the whole pathology department. It is desirable that the staff room should have windows with a pleasant outlook, providing natural lighting and ventilation; (see also paragraph 5.17 "Smoking".) Furnishings and decor should provide a relaxing environment, with comfortable seating and low tables.

4.33 Facilities for making beverages and washing crockery should be provided, together with provision for preparing light meals and for storing food in a small domestic-type refrigerator.

Seminar room/Technical library

4.34 The seminar room should comprise a technical library with provision for reading books and technical journals, and facilities for holding small informal lectures, conferences and seminars/discussions with laboratory and hospital staff, and students. Provision for the use of audio-visual aids will be required.

4.35 It may be convenient to site the seminar room adjacent to the staff room, with dividing acoustic folding partition to provide a larger conference room when required.

4.36 The location of these services within the pathology department complex should permit ease of access for all staff. If local policy dictates the use of the library area for demonstration of histopathology findings on appropriate museum prepared specimens, location near the histology department would be desirable.

On-call bedroom

4.37 Two rooms providing overnight stay facilities for on-call staff will usually be required with a bed, wardrobe and washing facilities. Additional provision may be made when necessary as a project option. A telephone in each room is essential. A shower and WC facilities should be provided.

Facilities which are required in each department

Offices

4.38 The number and types of offices required in each department are indicated in the description of that department's functional needs. Offices will be required for secretarial staff and for laboratory staff. The design and layout of the pathology department should provide for direct access to these offices from the general circulation route without the need for entry into any laboratory working areas.

Secretarial offices

4.39 Offices for secretaries should have facilities for desk work, use of a typewriter, microcomputer/word processor and telephone, filing records, holding limited quantities of stationery and office accessories, and facilities for hanging coats and grooming.

Laboratory staff offices and associated laboratory facilities

4.40 Offices for laboratory staff will be required for consultants and scientist equivalents and for senior scientific staff, junior doctors and head medical laboratory scientific officers (Head MLS0).

4.41 Two types of offices may be needed:

a. **Type A** — is for administrative duties, dealing with laboratory reports, consultation and discussion with other staff, holding and use of reference literature, and with facilities for hanging coats and handwashing;

b. **Type B** — as for Type A, plus a bench at which microscopic examination of slides can be undertaken. For Health and Safety reasons it is not intended for any other type of laboratory work.

4.42 All offices provided for laboratory staff should have easy access to laboratory facilities in an adjoining room. This laboratory facility is for the individual officer's work of a special nature or project of development type. This space could also be used for routine work when not required for a specific purpose. It is important that an efficient telephone transfer system should be provided to serve these offices and laboratory spaces.

4.43 The type of offices and grades of staff for whom they will be needed will be detailed when the individual department's needs are considered. The local project team will establish the number of offices which will be required.

Facilities for handwashing and hanging protective clothing

4.44 All laboratory activity areas require provision of a wash-hand basin with wrist or elbow operated taps and hooks for hanging protective clothing located near the exits of laboratory areas. Mirrors will be needed where emergency eye care items are located.

Storage in laboratory working areas

4.45 Adequate cupboard space and shelving will be required for storing "in-use" reagents, solutions in small and large volumes, laboratory consumables and miscellaneous items of laboratory equipment such as test tubes, pipettes, containers and racks. Where applicable a poisons cabinet will be required.

4.46 Facilities will be required for the storage of specimens, reagents and culture media under refrigerated or deep-freeze conditions. This need will be met by provision of refrigerators and freezers, and by access to a cold room.

Departmental laboratory store

4.47 Provision should be made for the storage of working stocks of materials and equipment in a storage area associated with each of the individual pathology departments. It should be easily accessible from the relevant laboratory areas. Additionally, some departments may require special stores for their sole use.

A facility which is required by some departments

Cold rooms

4.48 Cold rooms are needed by the chemical pathology, haematology and microbiology departments for storing specimens and reagents requiring refrigeration. These rooms should be maintained at 5° ± 1°C. Floor drainage will be required. Adjustable shelving should be provided for holding various types of tubes, bottles, racks and baskets. Cold rooms should be sited within easy reach of their main users (see paragraph 4.127).

CHEMICAL PATHOLOGY DEPARTMENT

4.49 Chemical pathology is the study of the changes that occur in the chemical constitution and biochemical mechanisms of the body in disease. The work flow in this department is shown in Figure 5. This department will normally undertake the following:

a. **Mechanised testing**

   As much as 80% of frequently requested tests can be undertaken on mechanised equipment, some of it incorporating a dedicated data processing system. These tests include the measurement of ions, substrates and enzymes;

b. **Manual testing**

   This includes all the non-mechanised tests, conducted both frequently and infrequently. Part of this work may be designated "emergency" and may be performed in a separate room. Certain immunoassay tests may utilize low-level radioisotopes and/or flammable solvents, in which case special facilities (which would generally be shared with haematology) will be required to handle these. It should, however, be noted that the use of radioisotopes is declining in favour of non-isotopic procedures.

4.50 Provision should be made for the following:

a. specimen reception/preparation/preliminary processing area and recording;

b. testing of blood, urine, faecal and other specimens by mechanised or manual processes for routine or emergency (Stat tests) work. These tests include the measurement of electrolytes, enzymes; liver and renal function tests;

c. testing of specimens by special procedures, for example, immunoassay for hormones and drug estimation, toxicology studies, protein and chromatography work;

d. storage/weighing/reagent-solution preparation and glass wash;

e. staff offices and laboratory facilities;

f. chemical store and preparation area;

g. cold room;

h. departmental store.

Specimen reception/preparation/preliminary processing and recording area

4.51 In the interests of safety the specimen reception area should be located in a separate room and be readily accessible both from the entrance to the department and the main laboratory working area. Specimens are received from the main specimen reception, sorted, batched, labelled and numbered, and work sheets prepared. Where appropriate, specimens are centrifuged and separated into suitable containers. Subsequent handling should be within a microbiological safety cabinet (Class 1) if necessary. Samples are batched together with request forms and transferred to the appropriate work space in the laboratory. Space is required for centrifuges, a laboratory sink, a microbiological safety cabinet, a refrigerator/freezer, and cold plate. Bench working space will be needed to carry out a variety of paper work as well as serum/plasma separation, and for packing samples prior to despatch to other laboratories for certain analyses. A fume cupboard for preliminary processing of faeces and a sluice for disposal of urine and faecal residues will be necessary. See HEI 86—'Fume cupboards'. Storage for small items of miscellaneous laboratory equipment (eg test tubes, pipettes, containers and racks), and handwashing facilities will be required.

General laboratory area

4.52 Tests of blood and other samples by mechanised or manual processes for routine or emergency work will be undertaken. Bench space will be required for this work and the necessary paperwork. It is difficult to predict the type of equipment which may replace present day models and to foresee their effect on future work in laboratories, but there is evidence that the newer instruments tend to be more compact and enable a greater range of investigations to be performed on a single machine. They also permit emergency work to be readily done without the need for supplementary equipment. Some of the apparatus will be freestanding. At an early stage consideration should be given to the need for fume cupboards and local extract ventilation and their location, and to the services that will be required in this laboratory.

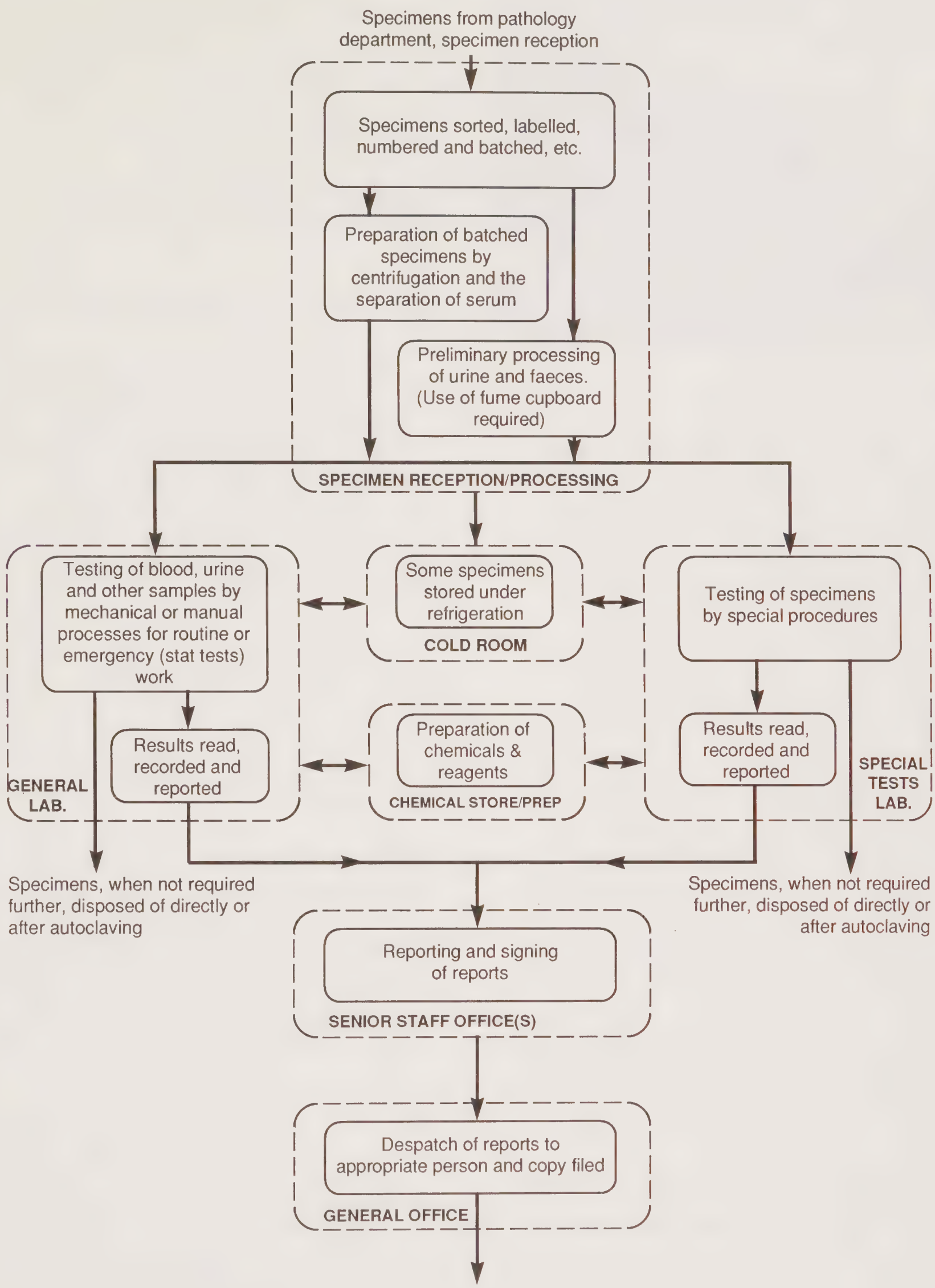


FIGURE 5 - Workflow through Chemical Pathology Department

Free standing analyser

4.53 Cupboard space and shelves will be required for storing "in-use" reagents, solutions in small and large volumes, disposables and miscellaneous small items of laboratory equipment. Specimens and reagents will also require to be held under refrigerated or deep-freeze conditions. This need will be met by provision of refrigerators and freezers, and access to a cold room.

Special chemical pathology tests laboratory area

4.54 The work undertaken in this area will depend on local policy. Space will be required for equipment, and bench space for reception of specimens and further preparation prior to testing, for general recording of results and writing reports and for in-use reagents and equipment. Specimens and reagents will need to be held under refrigerated or deep-freeze conditions. Services required and the need for a fume cupboard should be considered.

4.55 All laboratory activity areas require handwashing facilities, strategically positioned, and arrangements for hanging laboratory protective clothing.

Chemical storage/weighing/reagent-solution preparation and glass wash

4.56 Storage will be required for reagents and solutions, flammable and toxic chemicals, and strong acids and bases. It is important that the various classes of chemicals, for example flammables, oxidizing agents, acids and bases should be stored in separate areas within this room. A flammable liquids cabinet and a poisons cabinet should be provided.

4.57 This room will also be used for weighing and preparing reagents for use in the laboratory areas. Provision should be made for storing glassware and other equipment used in this area, with adequate benching for both working, and holding balances, mixers, stirrers, a hot plate and hot air oven. A sink and refrigerator will be required. A glasswash facility should be associated with the chemical storage and preparation area.

4.58 Provision for handwashing and holding of protective clothing should also be made.

Staff offices and laboratory facilities

4.59 Type A offices (see paragraph 4.41) will be required for the following staff: consultants or scientist equivalents; junior medical staff; junior scientists and the head Medical Laboratory Scientific Officer (Head MLSO). Office accommodation for secretarial staff will also be needed. Laboratory facilities should be provided for each consultant or scientist equivalent, junior medical and scientific staff and the Head MLSO. This accommodation may be shared between two members of staff providing it is adjacent to both offices.

HAEMATOLOGY DEPARTMENT

4.60 Haematology is the study of the blood, its functions and disorders. The workflow in this department is shown in Figure 6. This department will normally include the following sections:

a. **General haematology**

   Specimens of blood are subject to haemoglobin and platelet estimation and cell counting using mechanised equipment. Red cell sedimentation rate is assessed. A number of the blood specimens are spread on slides, stained and examined microscopically. Bone marrow preparations are also examined microscopically;

b. **Special haematology**

   This section of the department examines the several factors which affect the clotting of blood. Samples of blood are assayed individually for their ability to clot as compared to normal blood. Specialised work on the assay of enzymes, histochemical and serological studies, bone marrow processing, and the diagnosis of blood-borne parasite infection is frequently undertaken. Some of these tests are often batched and performed on two or three days each week;

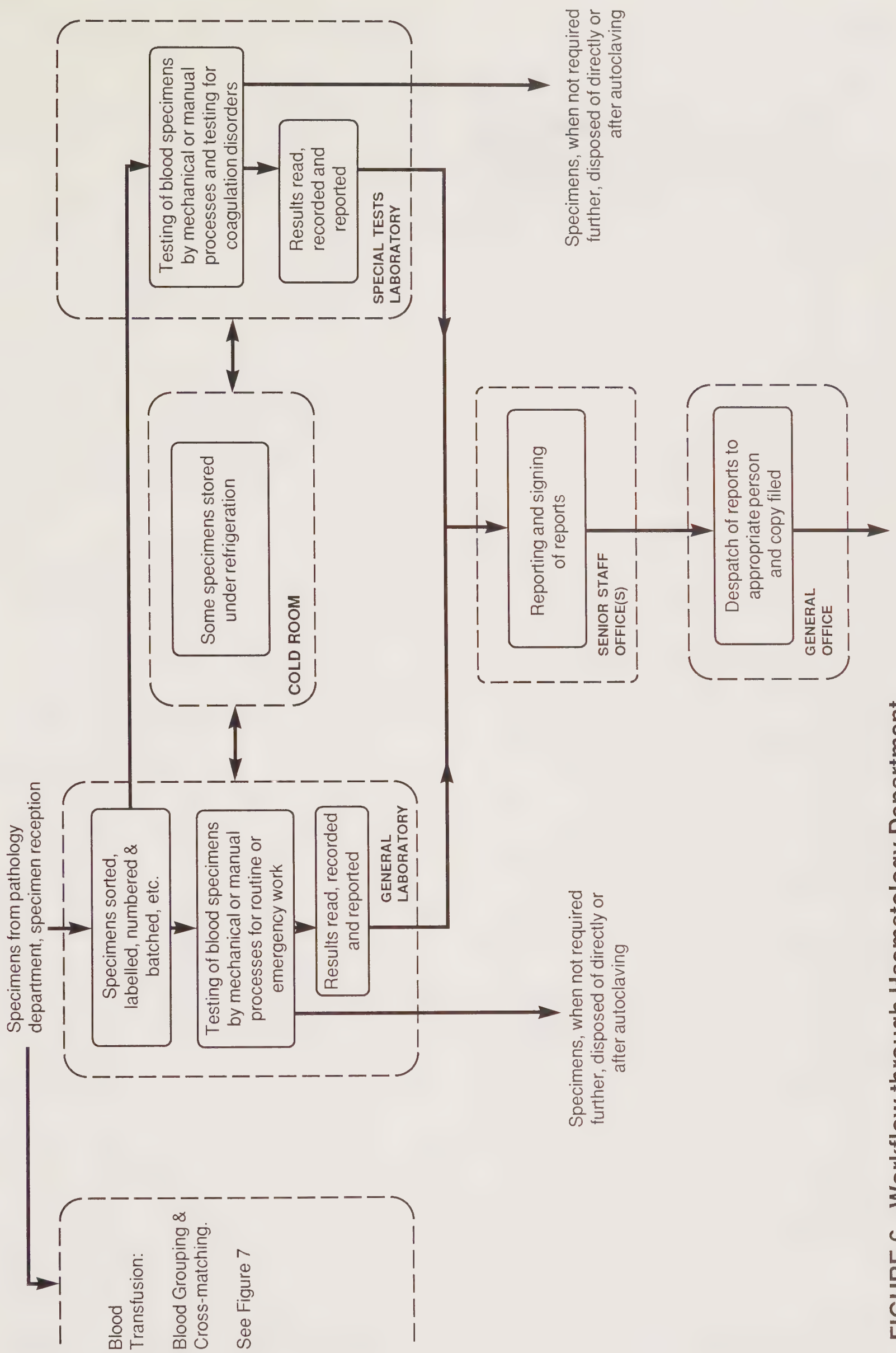


FIGURE 6 - Workflow through Haematology Department

c. **Blood grouping and cross-matching**

Blood for transfusion is usually already grouped when received from Regional Blood Transfusion Centres. It is tested in the hospital laboratory for compatibility with the blood of the patient who is to be transfused and whose blood group will also need to be determined. This work needs to be undertaken in an undisturbed environment in order to minimise the risk of error. Mechanised equipment may sometimes be used. Exceptionally, blood may be collected from donors in the venepuncture room under stringent safety conditions.

4.61 Provision should be made for the following:

a. the reception of specimens and general haematological testing by mechanised or manual processes for routine or emergency (Stat tests) work. These tests include red and white cell counts, platelet estimation, sedimentation rate assessment, bone marrow studies, slide preparations and microscopic examination;

b. special procedures including serology, coagulation studies, electrophoresis, red cell enzyme analysis, the detection of abnormal haemoglobins and immunology;

c. blood transfusion activities which include blood grouping, cross-matching and serology tests. A Blood Bank for storage of blood received from the Regional Blood Transfusion Service, and for holding cross-matched blood.

d. staff offices and laboratory facilities;

e. departmental store;

f. cold room.

General laboratory area

4.62 In this area bench space will be provided for receiving specimens from the main specimen reception point and for recording and labelling specimens prior to despatch to the appropriate working areas within the laboratory.

4.63 Space will be needed for automated cell counter facilities to undertake routine haemoglobin and particle estimations. These will be housed on adjustable worktops rather than fixed benches. Some apparatus may be free-standing.

4.64 Cell-counting, film preparation, staining (and the preparation of stains), and sedimentation tests will also be undertaken in this area. Staining of slides may be by manual or automatic processing. Adequate ventilation must be provided where necessary.

4.65 A quiet and undisturbed area is required for the microscopic examination of stained slides.

Special haematology laboratory area

4.66 In this area special haematological procedures will be carried out, for example, to check for blood coagulation disorder and abnormal haemoglobins. It is important that the results of coagulation studies should be rapidly available to the clinician or pathologist if patients attend a pathology department clinic.

4.67 Certain immunoassay tests may utilize low-level radioisotopes and/or flammable solvents, in which case special facilities (which would generally be shared with chemical pathology) will be required to handle these tests – see paragraph 4.49b. It should however, be noted that the use of radioisotopes is declining in favour of non-isotopic procedures.

4.68 The preparation of radiopharmaceuticals, including blood labelling, should be undertaken as described in Chapter 6 of HBN 29 – 'Accommodation for pharmaceutical services'.

Blood transfusion laboratory area

4.69 This comprises a reception area adjoining both a blood grouping and a cross-matching (compatability testing) laboratory. The workflow for this laboratory is shown in Figure 7.

4.70 The reception area should be easily accessible for deliveries of blood from the Regional Blood Transfusion Centre. Space is required for the storage of numerous blood transport boxes, and for recording and labelling of stock blood and specimens of patients blood received for grouping and cross-matching.

4.71 Un-cross-matched blood must be stored in Blood Bank refrigerators.

4.72 Blood is transported from reception to either blood grouping or the cross-matching laboratories.

4.73 The blood transfusion laboratory area should be partitioned off from the main laboratory area in order to avoid disturbance to the work and the consequent risk of errors. The former must be located near the entrance to the haematology department.

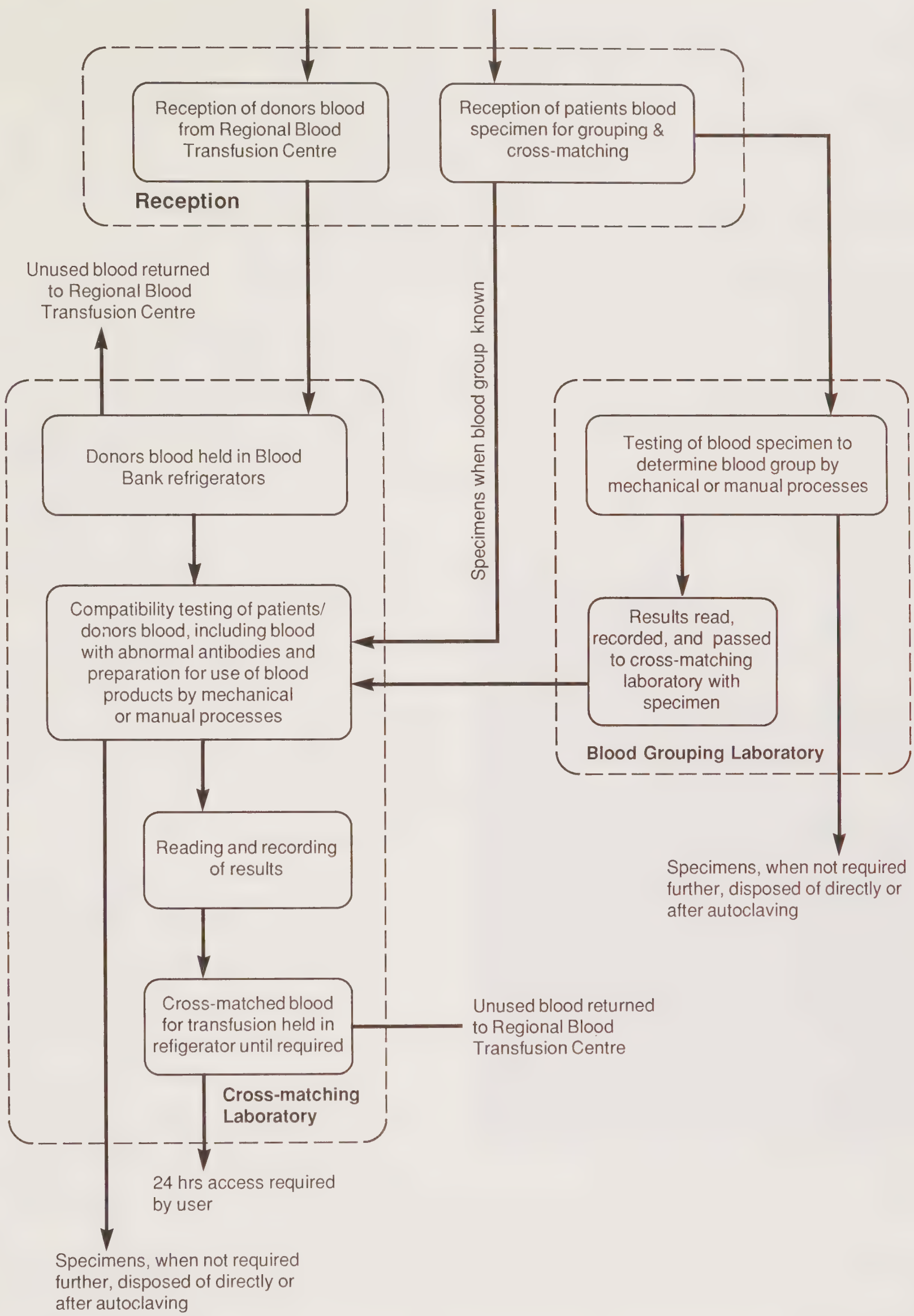


FIGURE 7 - Workflow through Blood Transfusion section of Haematology Department

Blood grouping area

4.74 Blood is treated by manual or mechanised methods to establish the blood group. Other serological tests may also be necessary. The work requires the use of centrifuges, incubator, water bath, cell washers and mechanised grouping apparatus. Test materials will need to be kept under refrigeration, or frozen.

Cross-matching area

4.75 Patients' blood (of known blood group) is tested for compatibility with donors' blood. Similar types of apparatus are required in this area as described in paragraph 4.74. Blood which has been cross-matched is stored in a blood bank refrigerator reserved for this purpose. Authorised personnel from the hospital require access to the Blood Bank at all hours. It must therefore be located so as to be readily available for continuous use by staff working in the cross-matching area, and also allow for out-of-hours access by staff from outside the laboratory. Its location should not require the latter to enter the laboratory, nor should it create a security problem.

Pass through Blood Bank refrigerator

Staff offices and laboratory facilities

4.76 Type B offices (see paragraph 4.41) will be required for consultants, junior medical staff and the Head MLSO. Laboratory facilities should be provided for each consultant, junior medical staff and Head MLSO. Office accommodation for secretarial staff will also be needed. This accommodation may be shared between two members of staff providing it is adjacent to both offices.

HISTOPATHOLOGY DEPARTMENT

4.77 Histopathology is the study of tissues removed from the human body. The workflow in this department is shown in Figures 8 and 9. This department will normally include the following sections:

a. **Histopathology**

The majority of specimens are received in formalin from operating theatres, out-patient clinics and post-mortem rooms, but items may also arrive in a fresh state. Some of the latter may require examination as frozen sections. Specimens are examined and selected portions of large, or the whole of small specimens, are passed through automatic tissue processing machines overnight. They are then commonly embedded in paraffin wax or resin blocks. When hardened, the blocks are cut into sections which are transferred on to slides, stained, protected by a cover slip and labelled. The consultant will then examine the section microscopically and make a report. Tissues remaining after the specimen has been cut up are stored until after the section has been reported. The prepared slides and blocks from which sections have been cut may be kept in accordance with HC(89)20. The provision of cytochemical analyses is currently increasing.

b. **Cytopathology**

Cytopathology is the study of individual cells collected by scraping from the surface of an organ, from a secretion or excretion or by needle aspiration from an organ or body cavity. A proportion of the specimens received may already be fixed on slides. Others will be in suspension in fluid and will need either to be spread directly or first centrifuged before they are mounted and processed for staining. Some specimens may require handling in a safety cabinet (see paragraph 4.92). Subsequently the stained slides are screened by microscopy by cytopathology staff and a report is made. A proportion of slides is referred to the consultant for further examination. All slides may have to be stored for many years.

4.78 Provision should be made for the following:

a. the reception of specimens; their gross cutting or dissection; dictation of findings and note-taking; photographing of specimens - this being a valuable record and teaching aid. The tissue is processed

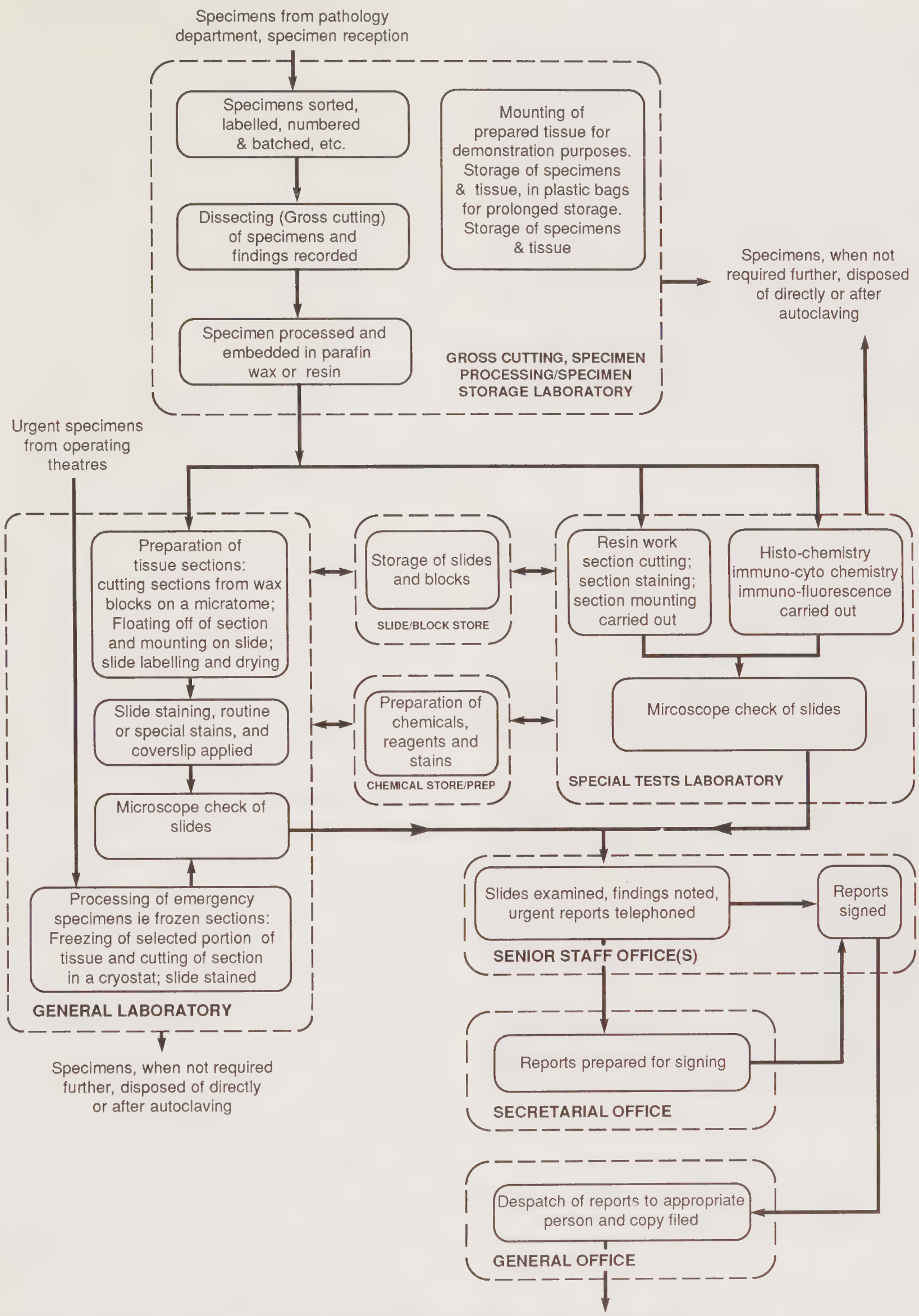


FIGURE 8 - Workflow through Histopathology Department

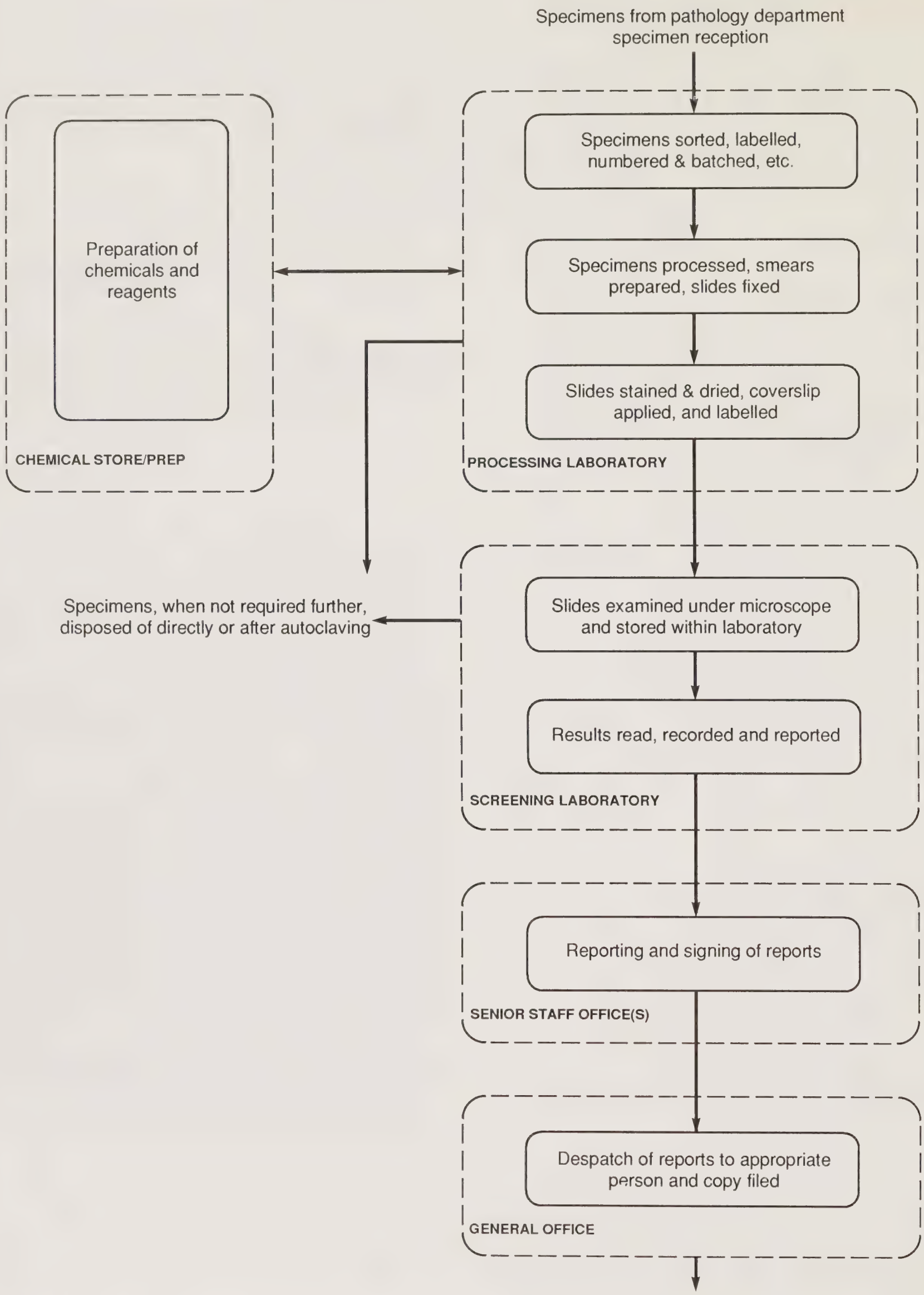


FIGURE 9 - Workflow through Cytopathology section of Histopathology Department

using mechanised systems and embedded in paraffin wax. Some tissue requires resin processing and embedding. Space is also required for storage of gross specimens for a variable time during and after processing and for mounting of prepared tissue for demonstration purposes;

b. the preparation of tissue sections (after gross cutting and specimen processing) by cutting sections from cooled wax blocks and floating them in a warm water bath. These are then mounted on a microscope slide, de-waxed and stained by mechanised or manual systems using routine or special techniques. Coverslips are applied manually or mechanically over the sections using styrene mountant and slides labelled. Frozen section investigations, involving freezing of selected portions of unfixed tissue and cutting sections are required for some examinations of specimens from operating theatres and for some immunohistochemical techniques. These are then dried or fixed and stained. All stained slides are placed in trays for despatch to the pathologist for microscope examination;

c. special histopathology procedures, which include resin work comprising section cutting, staining and mounting; histochemistry techniques or immuno-cytochemistry; immuno-fluorescence; and crystallography where slides prepared in the general laboratory are treated with antisera and dyes prior to microscopic examination;

d. cytopathology work which includes a processing area where slides are prepared and stained, and a screening area where they are examined microscopically;

e. departmental store;

f. chemical store and preparation area;

g. staff offices and laboratory facilities.

Specimen reception/cutting-up/ processing and storage room

4.79 Facilities for the reception of specimens from a main reception point serving the pathology department should be associated with the specimen cutting-up and processing room. Space will be required for sorting, checking, batching and labelling/numbering of specimens and recording of requests. Specimens are generally received immersed in formalin. It is advisable to deal with the nuisance caused by formalin in these containers by combining the reception of specimens with the specimen cutting-up and processing activities which are also subject to the same problem, and for which air extraction is required.

4.80 Specimen cutting-up will require a bench with an adjacent sink and tissue waste disposal unit, with adequate fume extraction, and dictation/note-taking facilities.

Specimen cutting-up bench with downflow fume extract

Specimen cutting-up bench with extract

4.81 The processing of specimens is carried out in tissue-processing machines. This procedure may be associated with the emission of formalin fumes.

4.82 Fumes associated with paraffin wax, embedding of tissues and resin processing and embedding techniques also cause a nuisance. This work can appropriately be undertaken in an area contiguous with the cutting-up and processing work area.

4.83 Space will be required for storage of gross specimens in various sized containers, for the preparation of specimens and tissues for prolonged storage in plastic bags (using heat sealing) and for the mounting of prepared tissue for demonstration purposes. Fume extraction, a sluice, and sink with waste disposal unit will be necessary. Specimen jars may also be washed in this area.

4.84 The activities described above are all subject to formalin and other vapour nuisance and should therefore be partitioned off from other working areas and adequate mechanical ventilation provided (see paragraphs 6.65-6.69).

General laboratory area

4.85 Space will be required for up to three cutting-up positions with microtomes, water baths and a shared hot air oven.

4.86 A separate area will be required for staining slides and will be divided into special and routine stain areas. This work will require space for a sink, mechanised slide staining, drying oven, and adequate bench space for holding glass dishes used in manual staining and for laying out slides during work.

4.87 Glass coverslips are then applied over the section (manually or mechanically) using styrene mountant. This releases toxic solvent vapours which require suitable extraction (HSE Guidance Note EH40).

4.88 Space will be required for frozen section work involving use of freezing facilities and cryostat or freezing microtome. Facilities for drying and staining the sections also will be required.

Special histopathology laboratory area

4.89 In this area provision must be made for resin work, involving the use of thin resin section microtome for cutting; for staining facilities; and mounting of the sections prior to microscopic examination.

4.90 Adequate bench space must be allowed for histochemistry procedures which involve numerous manual processes on a large number of slides.

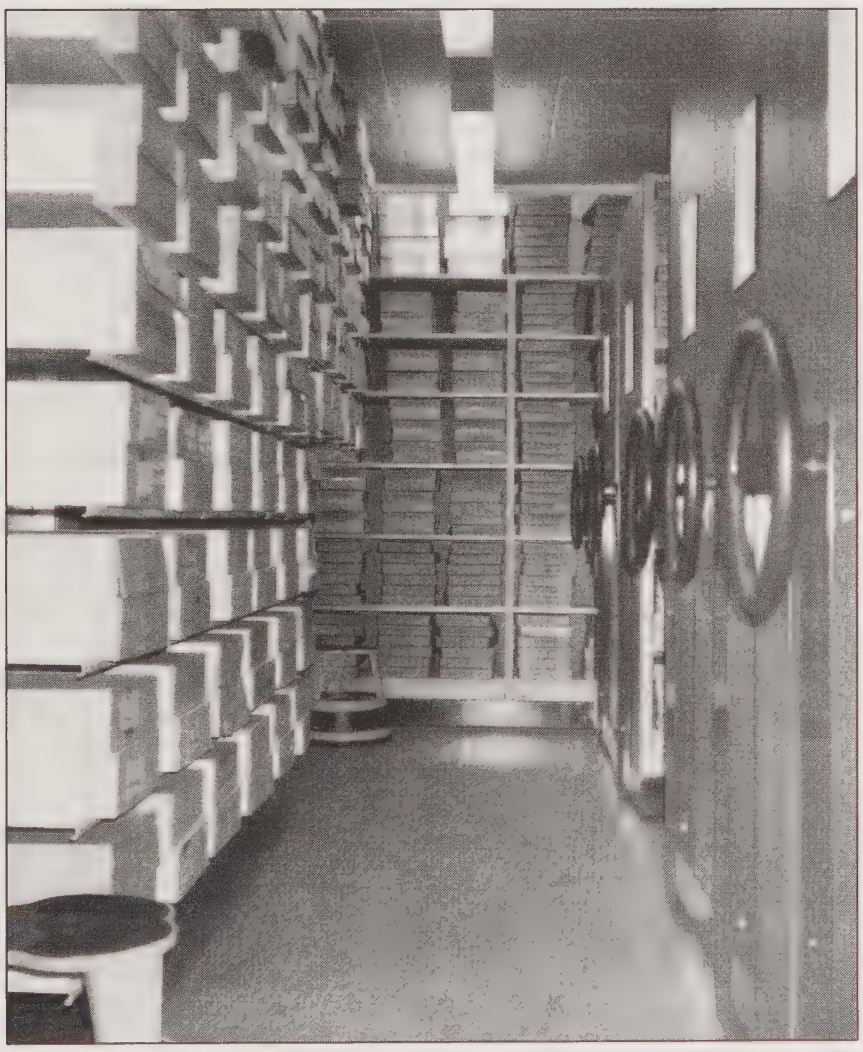
Slide and block store

4.91 Space will be needed for the storage of histopathology specimen blocks and slides in a position adjacent to the department. It should be noted that slide storage cabinets present heavy floor loadings. Consideration should be given at an early stage of planning to assessing the essential local requirement for current storage and possible long-term storage at a site outside the department.

Media preparation and plate pouring room

Slide and block storage

Slides — long term storage



Blocks — long term storage

Cytopathology processing area

4.92 Space will be required for the reception/recording of specimens and for the assembling, labelling and storage of specimen containers and forms. Specimens may need to be centrifuged. Processing of sputum and certain other specimens will need to be undertaken within a microbiological safety cabinet (Class I). The workflow in cytopathology is shown in Figure 9.

4.93 Staining of prepared slides may be by mechanised or manual methods. A slide staining machine will usually be used. Space must be allowed for this and for an adjacent sink.

4.94 Stained slides would be dried in a small oven or incubator, and, subsequently, a glass coverslip applied using a coverslipping machine. Fume extraction of solvent vapours will be necessary where slides are stained or dried, unless the machine has built-in extraction or features to reduce the release of solvent vapours to the air.

Cytopathology screening area

4.95 The microscopic examination of prepared slides is ideally carried out in a quiet area, free from interruption and noisy telephones, typewriters and computers. An average sized District General Hospital would expect to examine approximately 30,000 specimens each year and space for up to six microscope positions is required. The cytopathology screening area must be separated from the processing area but conveniently linked to it to facilitate effective and convenient working.

4.96 An area for prolonged storage of slides and reports will be needed. This will create an abnormal floor loading condition and must be considered at an early stage of planning — see also paragraph 4.91.

Chemical store and preparation area

4.97 Facilities will be required for the storage of chemicals and for the preparation of solutions and stains required in the histopathology department.

Staff offices and laboratory facilities

4.98 Type B offices (see paragraph 4.41) will be required for consultants, junior medical staff and the Head MLSO. Office accommodation for secretarial staff will also be needed. Laboratory facilities should be provided for each consultant, junior medical staff and the Head MLSO. This accommodation may be shared between two members of staff providing it is adjacent to both offices.

MICROBIOLOGY DEPARTMENT

4.99 Microbiology is the study of micro-organisms which include bacteria, fungi, viruses and parasites. Hospital microbiology is generally concerned with the diagnosis of human microbial diseases by the detection of organisms or their antigens in clinical specimens. Direct microscopy of specimens is used for rapid diagnosis and to decide on

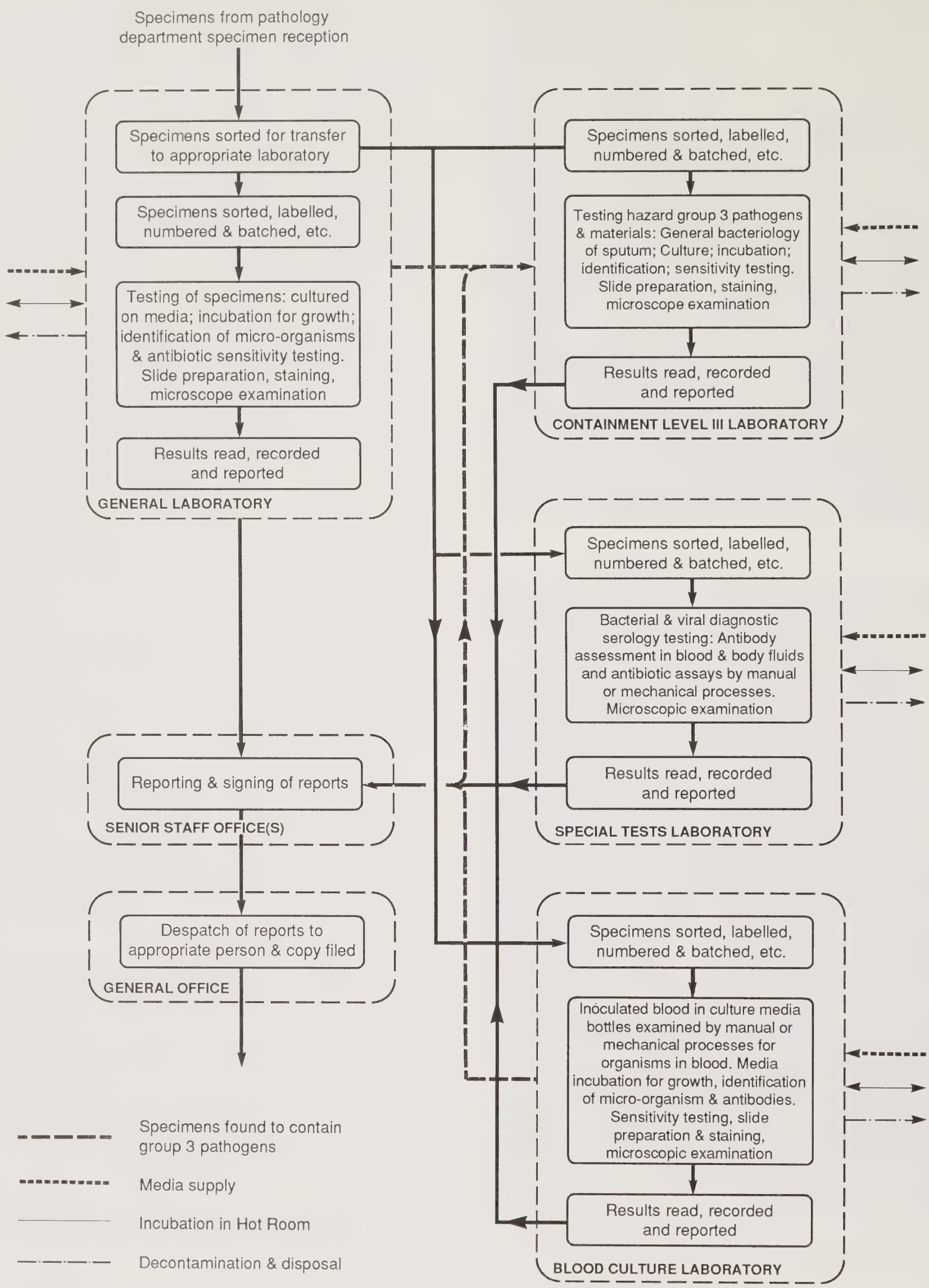


FIGURE 10 - Workflow through Microbiology Department

procedures to be used for isolation and identification of organisms present in such specimens or those from the hospital environment. Tests are also done for the demonstration of an antibody response to infection in patients' serum. The workflow in this department is shown in Figure 10. This department may include the following:

a. **Bacteriology**

Most of the work involves the examination of specimens to aid in the diagnosis of infection by bacteria, parasites and fungi and, where necessary, tests of the sensitivity of organisms to the antiobiotics used to treat patients. Some direct examinations in which results may be obtained within the day are commonly supplemented by the usual inoculation of culture media on which organisms will grow during incubation.

It is common practice to use standard commercial media formulations which are stored in a dried state and prepared for use as required by the addition of water and unstable supplements. Space will be required for this purpose. Most laboratories undertake this final preparative step in media preparation, although ready-to-use products can be brought in at a higher cost.

Serological tests are performed to demonstrate the presence of antigen and the presence of concentrations of antibodies to micro-organisms and viruses and to estimate the level of antibiotics in serum from patients under treatment. Some of this work is done in batches and may generally be regarded as less urgent.

b. **Virology**

Hospital virology is concerned with the diagnosis of viral diseases, and while the majority of specimens received are usually for serological testing (see above), virus isolation in cell cultures forms an important and specialised part of the work. Whilst in general the basic principles of some of the test methods are broadly similar to those used in bacteriology, this subject is a defined specialty requiring separate provision. Only a minority of district pathology services presently provide a comprehensive virology service; a full range of work is more commonly done in the PHLS. However diagnostic serology may be undertaken at district pathology departments.

c. **Public Health Laboratory Service laboratories**

The great majority of PHLS laboratories are located in hospitals where they provide a routine microbiological diagnostic and in some cases a reference service both to the hospital and to the community at large. Further consideration of PHLS laboratories is outside the scope of this Note.

4.100 Provision should be made for the following:

a. the reception of specimens and carrying out of general bacteriological investigations, culture identification and sensitivity testing of organisms derived from urine, wound, genital, faecal and other miscellaneous specimens. The tests include inoculation of appropriate liquid, semi-solid and solid culture media for the isolation and identification of micro-organisms and antibiotic sensitivity testing. Slides are also prepared and stained and then examined microscopically. Space will be required for examination of cultures (growth of organisms) and identification tests; sensitivity tests and recording of results; centrifugation of samples when necessary; and preparation of inoculated media for anaerobic investigations when appropriate. Incubation may require special conditions (eg CO_2) and temperatures;

b. investigation of Hazard group 3 pathogens and materials which may contain them, and general bacteriological investigations on sputum specimens. This work will be undertaken in Containment level 3 laboratory conditions;

c. bacterial and viral diagnostic serology and antibiotic assay in blood or other body fluids;

d. examination of blood specimens submitted in blood culture bottles containing a liquid medium which sustains growth of organisms that may be present in the blood. This allows for culture and isolation of any organisms, further identification of these and determination of their sensitivity to antibiotics;

e. sterilising, central wash-up, media preparation and plate pouring activities;

f. departmental store;

g. hot room;

h. cold room/refrigeration facilities;

j. staff offices and laboratory facilities.

General laboratory area

4.101 Space will be required for the reception of specimens from the main specimen reception, sorting, checking, batching and labelling/numbering of specimens and forms before despatch to the appropriate workstation in the laboratory.

4.102 General bacteriological investigations comprising direct microscopy, culture identification and sensitivity testing of organisms which may be present in specimens sent to the laboratory are normally undertaken at various workstations allotted for work on particular types of specimens eg urines, wounds and other swabs, genito-

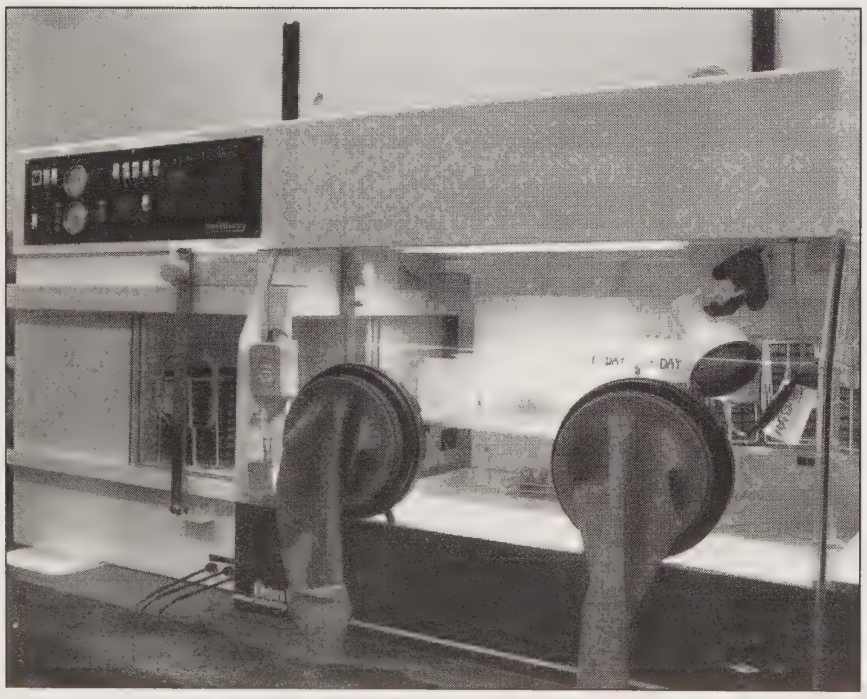
urinary specimens, faeces and miscellaneous work. One or two persons may operate at any workstation.

4.103 Space will be required for bench and free standing equipment and for bench activities. This includes the plating and inoculation of appropriate culture media for isolation and identification of micro-organisms and antibiotic sensitivity testing; preparation and staining of slides; examination of cultures; identification tests; sensitivity tests and recording of results.

4.104 Centrifuges will be required and these create noise and vibration problems and may interfere with other operations, for example the use of microscopes. Their location must therefore be carefully considered.

4.105 Facilities will be required for staining slides and for their microscopic examination including fluorescence microscopy. As the benches used for microscopy work should be free from vibration, this work is best located on one bench surface. An additional microscope will be required specifically for use at the urine examination workstation.

4.106 Inoculated media must be incubated under highly controlled temperature and atmospheric conditions eg aerobically, anaerobically, or in carbon dioxide atmospheres to obtain growth of organisms. Access to a hot room maintained at 37°C and use of separate incubators will therefore be necessary. Anaerobic isolation of organisms may require the use of special equipment with space and service implications, for example gas-liquid chromatography and anaerobic chamber.



Anaerobic chamber

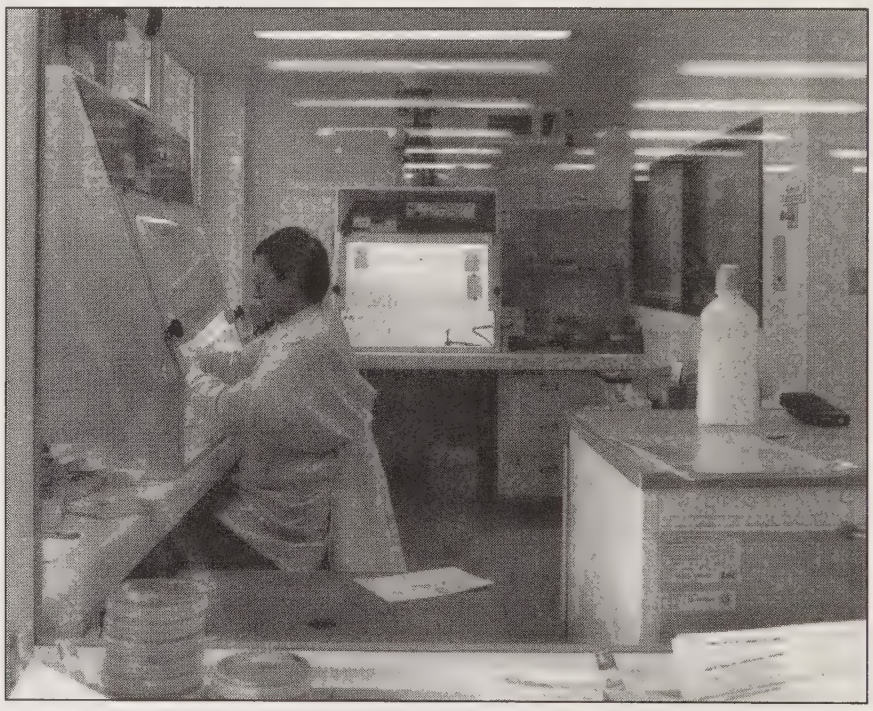
4.107 Adequate storage is required for "in-use" reagents, laboratory media and miscellaneous laboratory disposables and equipment.

4.108 Facilities are required for the storage of specimens, reagents and culture media under refrigerated and/or deep freeze conditions (see also paragraph 4.127).

4.109 Provision for handwashing and hanging protective clothing near the entrance/exit to the laboratory is particularly important in the microbiology department, as are adequate arrangements for safe and secure disposal of laboratory waste and discarding protective clothing.

Containment level 3 provision

4.110 In general, all laboratory activities involving specimens containing or suspected to contain pathogens from Hazard group 3 must take place in a separate room. This must conform to the Containment level 3 requirements defined in the Advisory Committee on Dangerous Pathogens Document (ACDP - 'Categorisation of pathogens according to hazard and categories of Containment'). A Class I microbiological safety cabinet will be required or a unit with equivalent performance and specification. Only in exceptional circumstances will a Class III safety cabinet be required - see Health Equipment Information No 86. In the case of HIV and hepatitis B virus specific guidance can be found in references given in paragraph 3.16 – see also paragraphs 6.41-6.49.



Containment level 3 room

Bacterial and viral diagnostic serology and antibiotic section

4.111 Space is required for the reception of specimens from the microbiology specimen reception bench and for recording, sorting and batching of sera.

4.112 Facilities are needed for testing sera for the presence of bacterial and viral antigens and antibodies and for the assay of antibiotics, by a variety of methods using tubes, microtitre plates and slides. This work involves use of specimen mixers, microtitre diluting and dispensing equipment, serum diluting and titrating apparatus, microtitre plate shaker, water baths at varied temperatures, and centrifuges. Space is also needed for

ELISA or similar equipment (comprising dispenser, washer and plate reader components), HPLC equipment, incubators and other smaller items used in this section.

4.113 Test results may be read microscopically or by using an agglutination viewer. Space is required for this equipment and for recording and writing reports.

Blood culture investigation room

4.114 Blood culture bottles are transferred from the microbiology reception bench and space is required for recording, sorting and batching these specimens. A large number of trays in which the inoculated blood culture bottles are placed need to be held in this room.

4.115 Slide preparations may be made at the outset or during investigations for growth or organisms to the blood culture media. Provision must be made for staining the slides and for their microscopic examination.

4.116 Blood is aspirated and inoculated onto appropriate liquid or solid culture media by manual and/or by the use of mechanised systems. Space is required for this work and associated equipment.

4.117 Bottles and inoculated culture media are incubated under various temperature and environmental conditions. This could conveniently take place in the hot room and in incubators (for example with CO_2) in the general laboratory. Provision would need to be made for electric shakers to be used in the hot room.

4.118 Any work requiring anaerobic conditions should be undertaken in the anaerobic chamber provided in the general laboratory.

4.119 Bench space for recording results and writing out reports must also be provided.

Sterilizing, central wash-up, media preparation and plate pouring area

4.120 These activities are related to each other. They are usefully planned as a unit combining the sterilizing and wash-up facilities with direct access to the media preparation room which in turn has direct access to the media dispensing/plate pouring room. The workflow is shown in Figures 11 and 12.

4.121 Facilities are needed for:

a. disinfection of contaminated material before disposal, and of glass and plastic ware prior to cleaning or disposal;
b. disposing of solid and liquid waste;
c. washing-up glassware by automatic machines or manually, including specialised glassware;
d. capping cleansed tubes and containers and subsequent sterilization;
e. storing sterilized items and materials;
f. preparing solid and liquid media in bulk;
g. sterilizing bulk media in laboratory autoclaves;
h. storing bulk materials, such as dried media preparations on open shelves or under refrigerated conditions;
j. filling of sterilized containers with prepared liquid media (either manual or automated methods);
k. storing of miscellaneous laboratory containers, tubes and caps, consumables and disposable items, labels and sundry items of minor equipment;
m. drying glassware in drying cabinets and sterilizing by dry heat;
n. labelling prepared media, tubes and bottles.

4.122 Media are poured into culture plates (Petri dishes) either manually or by a mechanised system (see 'Code of Practice for Installation of Media Preparators'). Some systems incorporate sterilizing, dispensing (pouring) and stacking of plates as a totally mechanised procedure. Manual plate pouring will need to be undertaken in a laminar flow cabinet.

4.123 Media preparation tends to disperse fine dust into the atmosphere, hence plate pouring should be in an area shielded from this activity.

4.124 Production of demineralised (de-ionised) water has to be considered for use in this activity area and other parts of the laboratory.

4.125 Three rooms will be required in which to accommodate the activities described in paragraphs 4.121 to 4.124 as follows:

a. central wash-up including production of demineralised water and sterilization facilities (autoclaves and hot air ovens). Very efficient ventilation is essential as unpleasant smells and much heat may be generated during some processes. Air cooling may be necessary;
b. media preparation;
c. plate pouring and media dispensing area, with laminar flow facilities.

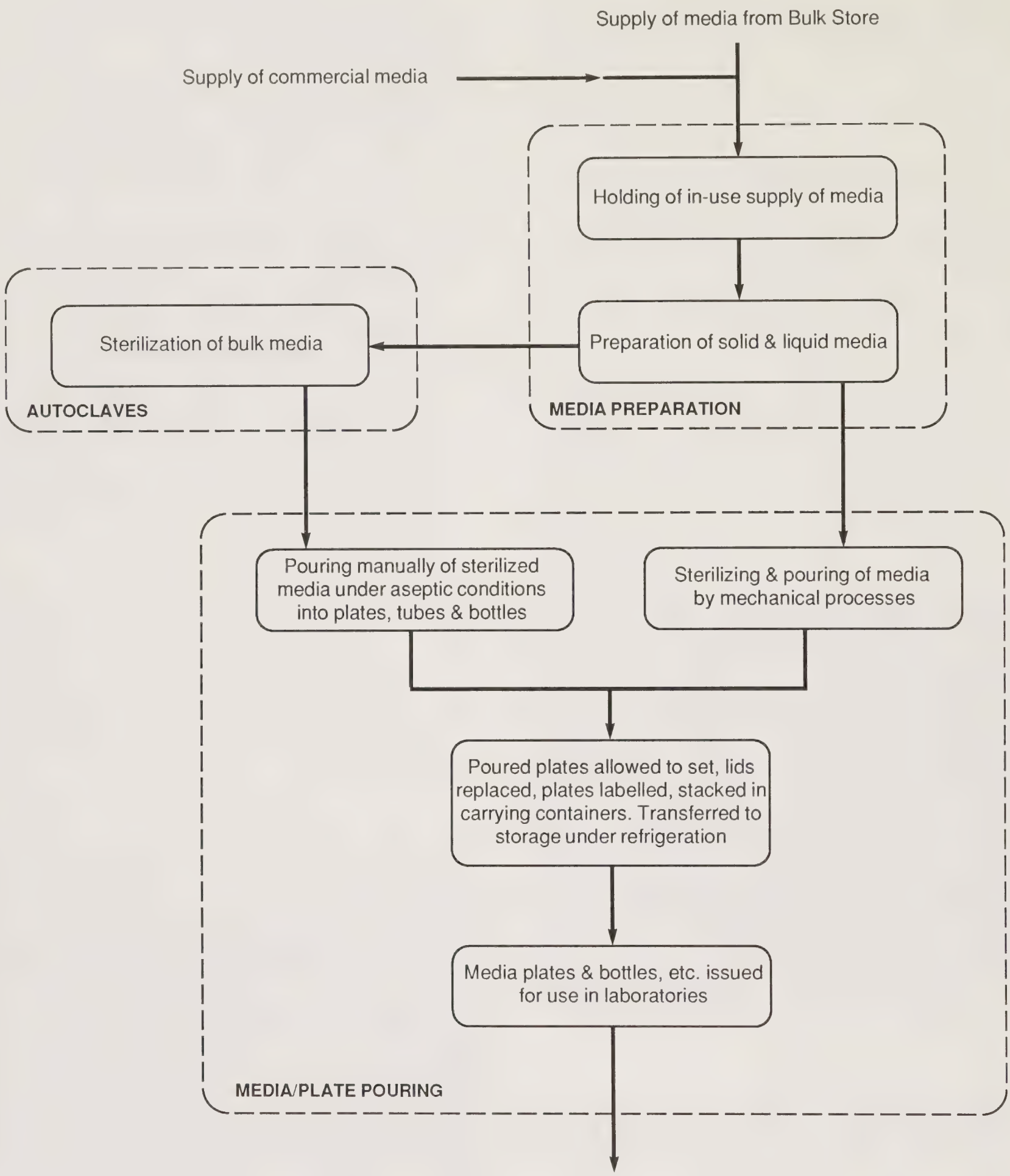


FIGURE 11 - Workflow through Media Preparation/Plate Pouring area

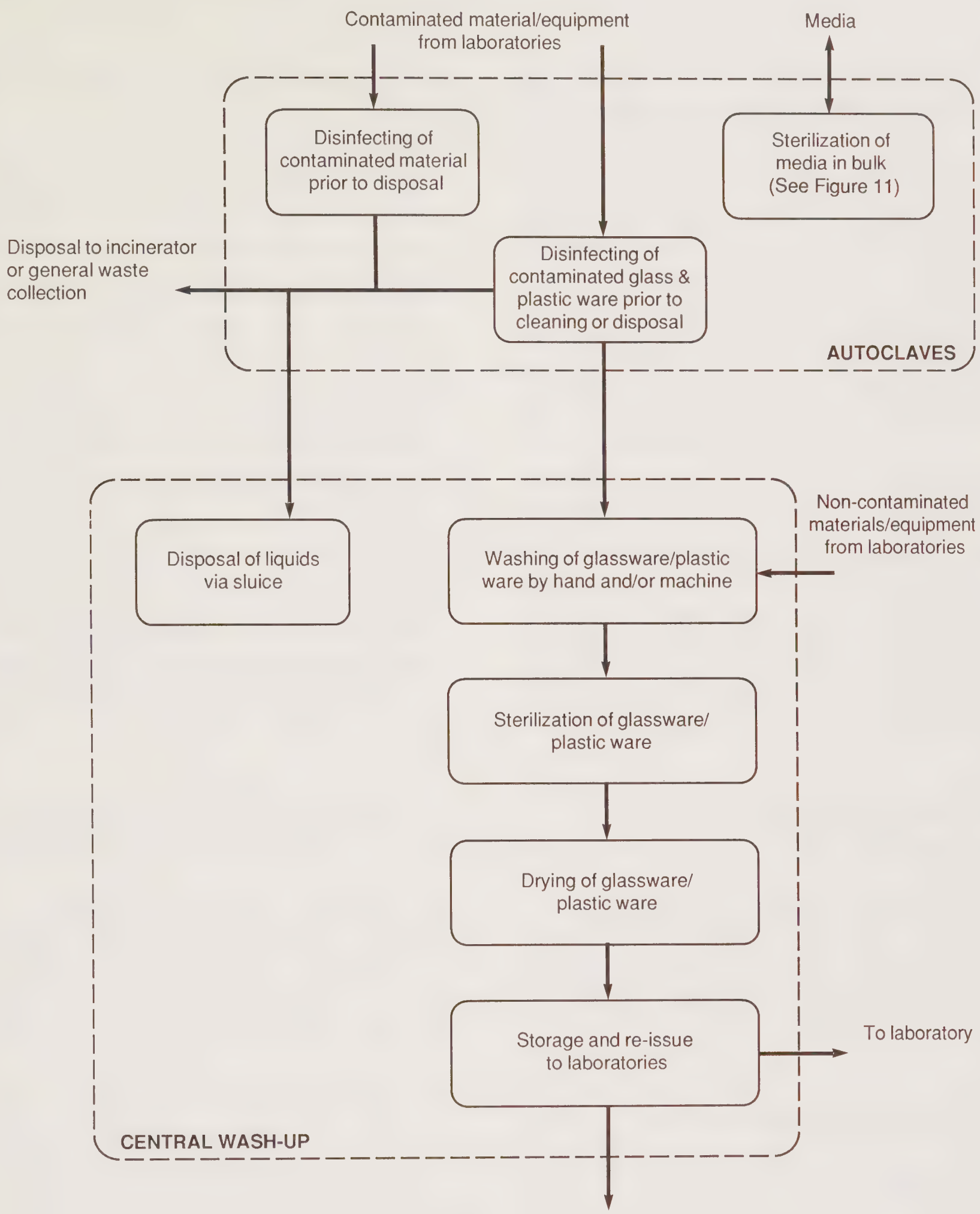


FIGURE 12 - Workflow through Autoclaves/Central wash-up

Hot room

4.126 A hot room is required for incubating cultures and this room should be kept at 37°C. Adjustable shelving will be required for holding various types of tubes, bottles, racks and baskets.

Cold room/Refrigeration facilities

4.127 Facilities are required in the microbiology department for the storage of a significant quantity and variety of specimens, media and reagents, and antibiotic sensitivity discs. Individual refrigerated storage is required throughout the department in close proximity to the working areas to facilitate efficient and safe working practices. Additionally, a cold room is necessary for bulk storage of kits and reagents and several days stock of culture media in poured plates, as well as virological culture media.

Staff offices and laboratory facilities

4.128 Type B offices (see paragraph 4.41) will be required for consultants, junior medical staff and the Head MLSO. Laboratory facilities should be provided for each consultant, junior medical staff and the Head MLSO. This accommodation may be shared between two members of staff providing it is adjacent to both offices. Office accommodation for secretarial staff will also be needed.

ESSENTIAL COMPLEMENTARY ACCOMMODATION

Office for Control of Infection nurse

4.129 A Type A office (see paragraph 4.41) will be required for use by the Control of Infection nurse, if located in this department.

OPTIONAL ACCOMMODATION

Staff office

4.130 A Type A office (see paragraph 4.41) will be required for a pathology common services co-ordinator, if such an appointment is made.

Additional accommodation

4.131 The following additional accommodation may be needed if staff appointments exceed those allowed for in the basic accommodation:

a. **Consultant's/Scientist equivalent's office**
   - (i) Type A office;
   - (ii) Type B office;
   - (iii) Laboratory facilities adjacent to above offices;

b. **Consulting/Examination room;**

c. **Space in junior medical staff office for a second person**
   - (i) Type A office;
   - (ii) Type B office;
   - (iii) Laboratory facilities adjacent to above offices;

d. **Space in junior scientific staff office for a second person**
   - (i) Type A office
   - (ii) Type B office
   - (iii) Laboratory facilities adjacent to above offices;

e. **Space in secretarial office for an extra person.**

5.0 General guidance

Introduction

5.1 This Chapter contains guidance concerning aspects of function and design which are common to health buildings generally and which will need to be borne in mind when designing new buildings or up-grading existing premises.

Works Guidance Index

5.2 Whilst this Note provides guidance that is current at the time of publication, it must be borne in mind that there are wider considerations associated with high risk infectious diseases, fire, energy conservation, etc., covered by other published guidance which must also be taken into account. Additionally, some aspects of the guidance in this Note may from time-to-time be amended or qualified. Project teams should first check the current edition of the Works Guidance Index. Because the Index is published by the Department in May each year, and updated only in September and January, project teams should ensure that they investigate the possibility of changes not included in the latest published Index.

Statutory and other requirements, including Crown immunities

5.3 This Note takes account as far as possible of all statutory and other requirements in force at the time of publication, but health authorities are reminded of their responsibility for ensuring compliance with all relevant statutes, regulations, codes and standards. Advice on this is given in HC(88)60/HC(FP)(88)29–in Wales, WHC(89)20.

With the general removal of Crown immunity from the NHS from 1 April 1991 and the setting up of NHS Trusts, building and planning law are legally enforceable on the NHS. Guidance on the removal of Crown immunity is given in HN(90)27/LASSL(90)15 – in Wales, WHC(91)4 - in respect of a wide range of legislation.

Economy

5.4 The planning of hospital buildings requires design solutions which not only satisfy functional requirements but also ensure maximum economy in respect of both capital and running costs. Due weight must therefore be given to the problems of space provision, maintenance, cleaning, energy consumption and staffing requirements. Planning should ensure that spaces are used as intensively as possible and are not unnecessarily duplicated.

Upgrading or adaptation of existing buildings

5.5 The standards set out in this guidance essentially apply to the provision of accommodation by new building and it is not intended that they should be applied retrospectively to existing stock. However, the principles are equally valid and should be applied, so far as is reasonably practicable, when existing accommodation is being upgraded or new accommodation is being constructed within an existing building which may previously have been used for other purposes.

5.6 The cost of upgrading work should conform to the guidelines indicated in the Department's WKO letter (81)4 – in Wales, AW0(81)8. Those guidelines take into consideration the estimated life of the existing building and the difference in cost between upgrading a building and new building.

5.7 Before any decision is made to carry out an upgrading project, consideration must be given to the long-term strategy for the service, the space required for the new service, and the size of the existing building. Regard must also be paid to the orientation and aspect of the building and the adequacy and location of all necessary services. If there emerges a prima facie case for upgrading, a thorough analysis of all functional and physical conditions of the existing building including engineering services should be undertaken.

5.8 When comparing the cost of upgrading or adapting an existing building to that of a new building, in addition to the building cost, due allowance must be made for the cost of relocating people, demolition and salvage costs, disruption of services in a phased project, and the temporary effects on running costs of any impaired functioning of areas affected by upgrading.

5.9 The check of physical and other aspects of existing buildings should include:

a. availability of space for alterations and additions;

b. type of construction;

c. physical constraints to adaptation such as load-bearing walls and columns;

d. insulation;

e. age of the buildings, condition of fabric, for example external and internal walls, floors, roofs, doors and windows;

f. life expectancy and adequacy of engineering services, ease of access and facility for installation of new wiring and pipework;

g. the height of ceilings; high ceilings do not necessarily call for the installation of false ceilings which are costly and often impair natural ventilation;

h. any changes of floor levels which may present a hazard to disabled people;

j. fire precautions (see paragraph 5.13);

k. calculated, or preferably known, energy consumption.

5.10 Having decided that existing premises are suitable for upgrading or conversion, the main requirement will be to assess how best the accommodation can be adapted so as to facilitate good practice. The main environmental factors which should be considered are the same as for new building.

5.11 Upgradings must conform to current fire safety and other statutory regulations. It is very difficult to estimate the fire resistance of floors, walls and doors of existing buildings.

5.12 This summary of the main aspects of upgrading is general in character and it is recognised that each upgrading project will present its own individual problems. In many instances compromises may have to be made between Building Note standards and what is possible to achieve. Upgradings should be functionally sound – not merely cosmetic – and appropriate for the projected needs of patients and staff for a number of years to come.

Fire precautions

5.13 It is essential that project teams familiarise themselves with the guidance contained in the FIRECODE series of documents which together give the Department's policy and technical guidance on fire precautions in hospitals and other NHS premises. In particular, the need for structural fire precautions and means of escape from the whole accommodation must be taken into account at the earliest possible planning stage. The key document for these aspects in hospitals is FIRECODE: 'Fire precautions in new hospitals', Health Technical Memorandum 81.

5.14 In addition, basic policy principles and key management guidance are contained in FIRECODE: 'Policy and Principles'. Other FIRECODE documents include the Health Technical Memoranda '80' series (which give technical guidance on various building, engineering and equipment issues), the Fire Practice Note series (dealing with various specialist aspects of fire precautions) and Nucleus guidance. Existing HTMs will, in due course, be reissued in FIRECODE format. The series includes FIRECODE: 'Directory of Fire Documents' which lists references to relevant legislation and fire precautions guidance issued by the Department and others, for example the Home Office. (FIRECODE was issued to health authorities with HC(87)24 – in Wales, WHC(88)6).

5.15 It is important to establish during the design stage those aspects of fire safety strategy which affect the design configuration and structure of a project and **to note that this department must not be utilized as a fire escape route by staff or patients from other departments in the hospital**. At appropriate stages of the design process, the architect and engineer should discuss and verify their proposals with the local fire authority, and ensure that the project team and all other planning staff are fully acquainted with the fire safety strategy for the design in terms of operation (staff responsibilities, etc), equipment provision, and buildings and engineering layouts. Health Technical Memoranda 57, 58, 59 and 60 give detailed information on the selection of fire resisting components. The principles of fire safety apply equally to new projects and to alterations and upgrading of existing buildings.

5.16 Parts of the pathology department may be classified as "high fire load", and the department should be located to give good access for fire fighting. The need for segregated storage of flammable materials has been considered elsewhere in this Note. (See Fire Practice Note – 'Laboratories' – in preparation.)

Smoking

5.17 Health Circular HC(85)22 dated May 1985, (WHC(85)31 dated July 1985 in Wales) provides guidance about smoking on health premises. While recognising that the responsibility for determining local policies rests with the health authority, smoking is forbidden in laboratory areas. Where it is permitted, it must be confined to specially designated areas which are clearly signposted. In such areas ventilation should be sufficient to prevent discomfort to non-smokers and the spread of odours to other areas of the premises.

Critical dimensions

5.18 Information on critical dimensions for some of the activities mentioned in this Note is included in HBN 40- 'Common Activity Spaces'. In addition BS3202: 1959, 'Laboratory Furniture and Fittings' (currently being updated) gives recommended distances between laboratory benches together with their required depths. Consideration should be given to the necessity for providing "back to back" working space with a passage way between. Alternatively where conditions permit, workstations may be staggered along the bench length, thus enabling economies in space to be made by reducing the clear distance between benches. The ergonomic diagrams in the Appendix contain information on critical dimensions for these activities.

Information technology in the NHS: provision for Automatic Data processing (ADP)

5.19 Computers, which make possible the automatic processing of much hospital data, have been installed in many laboratories. The implications for building project teams are threefold:

a. housing the computer(s);

b. provision of ducts for tranmission cabling;

c. provision of modems, visual display units and printers.

Even if the introduction of automatic data processing is not proposed at the time that the project team completes its task, it will be advisable to design in such a way that equipment can be introduced easily and quickly at some later date.

5.20 There are two principal matters of concern: visibility and noise. Visual display units (VDUs) are now a familiar sight and it will easily be appreciated that they cannot be reduced beyond a certain size. Consequently, sufficient and convenient space must be provided for them. Since the brightness of the letters displayed on the screen cannot exceed a certain limit, special attention must be given to the ambient lighting to ensure that the contents of the screen are legible. Space will be required in front of the screen for a keyboard. The problem of noise arises from the alternative way of obtaining data from the computer, namely a printer which can provide printed paper copies of the data in the computer. Much has been done to reduce noise and the latest laser printers work reasonably silently.

5.21 Computing expertise is now widely available in the NHS and project teams should ensure, at an early stage, that they inform themselves concerning current and projected local computing policies, and that their proposals conform with them.

Education and training

5.22 Although education requiring special facilities will take place in the district's education centre, some teaching has to take place in the department. Apart from the use of seminar rooms, no special facilities are normally required elsewhere.

5.23 The requirements of students in the laboratory professions will need to be taken into account, and the appropriate people and/or bodies should be consulted at the initial planning stages.

Note. Reference should be made to the Department's letter DS 65/74 about teaching hospital space requirements, issued on 22 March 1974, and letter DS 86/74 dated 27 March 1974. (In Wales, reference should be made to letter HSD 3/57/1 dated 29 April 1974.)

Maintenance and cleaning

5.24 Regular and intensive cleaning must be a feature of this accommodation. Materials and finishes should be selected to minimise maintenance and be compatible with their intended function. Building elements that require frequent redecoration or are difficult to service or clean should be avoided. Special design consideration should be given to elements such as entrances, corners, partitions, counters and any others which may be subjected to heavy use. Wall coverings should be chosen with cleaning in mind. Health Technical Memoranda 56, 58 and 61 give guidance on these aspects for partitions, internal doorsets and flooring.

Component Data

5. 25 The Component Data Base consists of a series of Health Technical Memoranda which provide specification and design guidance on building components for health buildings.

The HTMs in the series are listed in the Bibliography at the end of this Note.

In its previous forms the Component Data Base contained specifications and design guidance together with lists of selected components or firms producing those components for use in health buildings. No firms or products are now listed.

The technical information in this series is the result of research and development funded by the Department as part of collaborative working arrangements over a number of years between the Department, the NHS and industry through the medium of Component Data Base, managed by a Steering Group mainly staffed by NHS professionals.

Damage in health buildings

5.26 When designing and equipping health buildings, the likely occurrence and effects of accidental damage should be considered. Damage in health buildings has increased over the years, to some extent as a result of lightweight, often less robust, building materials. Measures to minimise damage should be taken in the form of protective corners, buffers and plates where necessary, and to proper continuation of floor surfacing ie strong screeds and fully bonded floor coverings. Protective devices, if used, should be capable of being renewed as need arises.

Disabled people

5.27 It is essential to ensure that suitable access and facilities are provided for disabled people who have problems of mobility and orientation. This includes, besides the wheelchair-bound, those who for any reason have difficulty in walking and those with a sensory handicap such as a visual or hearing impairment. Authorities are reminded of the need to comply with the provisions of:

The Chronically Sick and Disabled Persons Act l970;

The Chronically Sick and Disabled Persons (Amendment) Act 1976;

The Disabled Persons Act 1981;

The Disabled Persons (Services, Consultation and Representation) Act 1986;

The Building (Disabled People) Regulations 1987.

Attention is also drawn to BS5810:1979 'Access for the Disabled to Buildings' (under review). One of the effects of the 1981 Act is to apply this British Standard to premises covered by the 1970 Act, which includes those open to the public. Practical guidance for complying with the Building (Disabled People) Regulations is issued by the Department of the Environment under Approved Document 'M': Access for the Disabled.

Project teams are encouraged to refer to HBN 40 – 'Common Activity Spaces Volume 4 Designing for Disabled People'. This gives guidance and a set of Ergonomic Data Sheets on access, space and equipment relating to disabled people in health buildings.

Signposting

5.28 Signposting should form part of the Whole Hospital policy and be in accordance with the Department' s signposting manual, HTM 65 - 'Signs'.

Courtyards

5.29 There are several reasons why courtyards may usefully be provided in hospital buildings. They enable more rooms to receive natural daylight and ventilation, and can provide a stimulating outlook from staff areas, and thus compensate for the lack of a longer view. Suitable layout and planting can help to preserve privacy in surrounding rooms. Ground-cover planting is often more successful than grass and is easier to maintain.

5.30 It is desirable to provide access to courtyards from corridors wherever possible and thresholds should be designed to facilitate movement of disabled people. Seating should be provided. Access for maintenance and cleaning should be from a hospital street or corridor so that staff are not disturbed. Adequate water points, power points and lighting, if necessary, should be provided in all courtyards. Reference should be made to HBN 45–'External works for health buildings' – (in preparation).

6.0 Engineering services

Introduction

6.1 This Chapter describes the engineering services contained within the pathology department and how they integrate with the engineering systems serving a whole site. The guidance should not inhibit the design solution, but will acquaint the engineering members of the multi-disciplinary design team with the criteria and material specification needed to meet the functional requirements.

6.2 Documents referred to by number, for example [10], are listed at the end of this Chapter. Each repeated reference retains the same number.

Model specifications

6.3 A series of model specifications, for the specialised engineering services in health-care buildings, have been issued nationally and are sufficiently flexible to reflect local needs. The cost allowance is based on the qualities of material and workmanship described in the relevant parts of the model specifications.

Economy

6.4 Engineering services are a significant proportion of the capital cost and a continuing charge on the revenue budget. The project design engineer should therefore ensure:

a. economy in provision, consistent with meeting the functional requirements;

b. optimum benefit from the total financial resources these services are likely to absorb during their lifetime.

6.5 Where alternative design solutions are available their consequential capital and running costs should be compared using option appraisal techniques [1]. In this way due consideration is given to the need for, and cost of, maintenance and the eventual replacement of plant and equipment.

6.6 Heat conversion and distribution losses can be significant where buildings are located remote from the developments energy centre. The economic appraisal of alternative locations and design solutions should take this factor into account.

6.7 In any new project, consideration should be given to energy management, and facilities offered by a Whole Hospital control system, to enable some measure of energy accounting to be exercised at departmental level. These facilities should include meters for heat, electricity, gas, water, steam etc as appropriate.

6.8 After satisfying the Building Regulations [2] on the standards of thermal insulation provided, the design team should consider the economics of additional insulation.

6.9 In view of the increasing cost of energy, the design team should also consider the economic viability of heat recovery from mechanical ventilation systems. Designers should also ensure that those services which use energy do so efficiently.

Maximum demands

6.10 User demand on engineering services is often difficult to predict, but experience indicates that services designed for simultaneous peak conditions are seldom fully utilised in practice. The estimated maximum demand, and storage requirement where appropriate, for each engineering service in this accommodation, will need to be assessed individually to take account of the size and shape, geographical location, operational policies, and intensity of use of the department. As a guide, and for preliminary planning purposes only, the table on page 48 shows the estimated maximum demands for a department comprising chemical pathology, haematology, histopathology, microbiology and support accommodation.

Space requirement for services

6.11 Space for plant and services is important and the layout should provide:

a. easy and safe means of access, protected as far as possible from unauthorised entry;

b. space for frequent inspections and maintenance;

c. for eventual removal and replacement of plant.

6.12 Recommended spatial requirements for mechanical, electrical and public health engineering services in health buildings are contained in HTM 23 [3]

Service	Typical max demand	Notes
Heating/ventilation/DHWS	430 KW	
Cooling	85 KW	
Cold water	2.5 litres/sec	10,000 litres storage (24 hour supply)
Laboratory cold water	3.0 litres/sec	12,000 litres storage (24 hour supply)
Deionised water	1.0 litres/sec	400 litres storage
Hot water service	2.9 litres/sec	1,000 litres storage (2 hours recovery)
Supply ventilation	12 m^3/s	
Extract ventilation	13.55 m^3/s	
Electrical	178 KVA	incl 69 kVA essential
Fuel gas (bench services)	0.6 litres/sec	
Steam	0.1 kg/sec	at 5 bar
Pathology gases		
- hydrogen		(litres/month))
- acetylene		(litres/month))
- carbon dioxide		(kg/month)) see HTM 22
- nitrogen		(litres/month))
- argon		(litres/month))

The information in this publication is specifically intended for use during the initial planning stages when precise dimensional details of plant are not available.

6.13 The distribution of mechanical and electrical services to final points of use should, wherever possible, be concealed in walls, above ceilings and in bench service spines. Heat emitters should be contained within a 200mm wide perimeter zone under window sills, and critical dimensions (see Appendix) should be taken from the boundary of this zone. For costing purposes the 200mm zone, which includes the floor area occupied by minor vertical engineering ducts, is included in the building circulation provisions.

Flexibility of services distribution systems

6.14 This department will be subject to growth and frequent change and an imaginative layout of the services should take this into account. Services should be planned so that maintenance and modifications may be effected with the minimum of disturbance. Drainage, bench services, and ventilation are likely to require the most frequent maintenance, modification or renewal, during the life of the building. The method of distributing these services should be given special attention. Vertical or horizontal systems of distribution may be used and each method has its own characteristic advantages and disadvantages. Extensive distribution of pipework containing tees and plugged outlets for future use should be avoided. Instead, vertical and horizontal services ducts and bench spines should be readily accessible so that the system may be modified and maintained without unduly disrupting the department.

Activity Data

6.15 Functional requirements, environmental data and equipment details, are described in the Activity Data Sheets (Chapter 8) and should be referred to when positioning equipment and outlets.

Safety

6.16 Section 6 of the Health and Safety at Work etc Act 1974[4] as amended by Schedule 3 of the Consumer Protection Act 1987[5] imposes statutory duties on all persons who design, manufacture, import, supply, install or erect "articles for use at work". One of the requirements of this section is to ensure, so far as is reasonably practicable, that the article is designed and constructed so that it will be safe and without risks to health at all times when it is being set, used, cleaned or maintained by a person at work. All parts of engineering systems are covered by the term "articles for use at work".

Fire precautions

6.17 Design guidance for fire precautions in health buildings is contained in FIRECODE [6]. It includes HTM 81 [7] and other Memoranda in the '80' series. Technical information concerning the design and specification of fire detection and alarm systems is contained in HTM 82 [8] which also replaces or modifies certain clauses of BS5839 Part 1[9] to meet the needs of health buildings. More general advice on fire prevention, including the storage of flammable materials, is contained in HTM 83 [10].

6.18 The design should comply with the requirements of FIRECODE and the engineer should verify his proposals in accordance with the procedure described in this Note, paragraph 5.13.

Noise

6.19 Excessive noise in individual areas, whether internally or externally generated and transmitted, can adversely affect the operational efficiency of the department and can cause discomfort. The limits and means of control advocated in Hospital Design Note 4 [11], including its revisions [12], and the means of control given in Engineering Data Sheet DH1 [13] should provide an acceptable acoustic environment.

6.20 There will also be a need to ensure auditory privacy in a number of spaces. This will typically, but not exclusively, be required in consulting/examination rooms. Acceptable noise levels and, where applicable, any requirement for auditory privacy in individual spaces are shown on the Activity Data A-Sheets.

Control access

6.21 Primary engineering distribution control and isolation devices should be:

a. located in circulation rather than working areas;

b. protected against unauthorised operation, for example switchgear and fuse-boards should be housed in secure cupboards;

c. easily accessible for safe operation by staff, where appropriate.

Engineering commissioning

6.22 It is essential that engineering services should be fully commissioned. HTM 17 [14] describes the requirements which should be included in the design and contract documents. Flow measurement and proportional balancing of air and water systems requires adequate test facilities, for example, orifice plates, venturi valves, pilot tube tappings, etc., to be incorporated at the design stage.

MECHANICAL SERVICES

General scope

6.23 The mechanical installation includes:

a. heating;

b. ventilation (including an appropriate proportion of the air handling and treatment plant, refrigeration plant, and associated controls);

c. cooling;

d. microbiological safety cabinets, fans and ductwork;

e. fume cupboards, fans and ductwork;

f. extract hoods and dissecting bench extract systems, including fans and ductwork;

g. hot and cold water;

h. fire main;

j. pathology gases;

k. steam;

m. sterilizers;

n. water purification plant;

p. washing and drying equipment.

6.24 For cost allowance purposes, the distribution of the services commence at their points of entry into the department.

6.25 Recommended room temperatures, air change rates, hot water services temperature, etc, are grouped under "technical design data" on each A-Sheet. The B–Sheets give the disposition of engineering outlets for the activities described.

Heating

6.26 General space heating requirements can usually be met by low pressure hot water radiators. They should be located under windows or against exposed walls, with sufficient clear space between the top of the radiator and the window-sill to prevent curtains reducing the output. Adequate wall space between benches and space below radiators to allow cleaning machinery to be used should

also be allowed. Where a radiator is located on an external wall, back insulation should be provided to reduce the rate of heat transmission through the building fabric.

Temperature control

6.27 All radiators should be fitted with thermostatic radiator valves. These should be of robust construction and selected to match the temperature and pressure characteristics of the heating system. The thermostatic head, incorporating a tamper-proof facility for presetting maximum and minimum room temperature, should be controlled via a sensor located integrally or remotely as appropriate. To provide frost protection at its minimum setting, the valve should not remain closed below a fixed temperature.

6.28 Consideration should also be given to modulating the flow temperature to the heating appliances in accordance with the external ambient temperature.

6.29 Where practicable the heating system should be time-switch-controlled and programmed to accommodate the working hours of the unit. The control system, possibly incorporating an optimum-start device, should be used to set-back the space temperature to an anti-condensation level of approximately 10°C when the accommodation is closed (actual set-back to be determined from local trials). To allow for occasional abnormal hours of working, a conveniently sited time-restricted manual override switch should be included to extend the normal heating period.

Ventilation

6.30 A number of factors determine the ventilation requirements of this department:

a. those associated with human habitation (fresh air requirement);

b. those associated with the activities of the department odours, aerosols, gases, vapours, fumes and dust – some of which can be toxic, infectious, corrosive, flammable or otherwise hazardous. Work must be undertaken in a microbiological safety cabinet or fume cupboard as appropriate;

c. heat gains from equipment (these will be high in the wash-up and sterilizing areas and in some laboratory areas but relatively low elsewhere — extract canopies should be used where appropriate to reduce the effect on the room environment);

d. solar heat gains, if windows are sealed;

e. the extent of unavoidable deep planning.

6.31 Mechanical ventilation systems are expensive in terms of capital and running costs and planning solutions should be sought which take maximum advantage of natural ventilation.

6.32 It is acknowledged that planning constraints imposed by the building shape and/or functional relationship of specific spaces will often result in some provision of enclosed internal areas. Ventilation costs can, however, be minimised by ensuring that, wherever practicable, core areas are reserved for rooms that require mechanical ventilation irrespective of whether their location is internal or peripheral. Examples are sanitary facilities and rooms whose functional requirements have specific environmental needs and where windowless accommodation is acceptable. Other spaces appropriate to core areas are those which have only transient occupation and, therefore, require little or no mechanical ventilation. Examples are circulation and some storage areas.

6.33 A low velocity mechanical ventilation system should be used. Diffusers and grilles should be located to encourage uniform air movement within the space without causing discomfort to staff. The design should allow for an adequate flow of air into any space having only mechanical extract ventilation. Transfer grilles in doors or walls may be used to connect such spaces to naturally ventilated corridors or spaces with mechanical air supply. Such arrangements, however, should avoid the introduction of untempered air and should not prejudice the requirements of fire safety, privacy, security or comfort. However, transfer grilles should not be provided in the specimen cutting and tissue processing rooms or in other rooms where malodorous processes are carried out. (See also paragraph 6.37.)

6.34 The supply air distribution system should not distort the unidirectional and stable air flow pattern required for fume cupboards and microbiological safety cabinets. In general, supply air ceiling diffusers or grilles should not discharge directly towards fume cupboards or safety cabinets, unless the terminal velocity is such that the air flow pattern of the cabinet is unaffected. In practice, grilles and diffusers should be positioned some distance from the front face of fume cupboards and safety cabinets. The design should ensure that high air change rates and/or opening and closing doors do not have an adverse effect on the performance of safety cabinets or fume cupboards. A damped door closure mechanism may help.

6.35 Ventilation supply plant should include air filters having a minimum arrestance of 85% when tested in accordance with BS6540, Part 1 [15]. In urban or other areas of high atmospheric pollution, a higher standard of

filtration may be economically justified to reduce the level of staining to internal finishes. Filters must be readily accessible for replacement and maintenance purposes. They should be provided with an audible and visual pressure-differential alarm to indicate when replacement is required.

6.36 External discharge arrangements for extract systems should be protected against back pressure from adverse wind effects and should be located to avoid reintroduction of exhausted air into the building through air intakes and windows.

6.37 The ventilation systems should maintain a net inward flow of air at all times to mechanically ventilated spaces containing safety cabinets, fume cupboards, bench extract systems, and canopies. This principle is particularly important in the Containment level 3 laboratory, the central wash-up/autoclave area, and other areas such as the dissecting bench area in histopathology where unpleasant odours from formalin can be a health hazard. These extract systems will require a substantial volume of suitably filtered and tempered supply "make-up" air, particularly where safety cabinets or fume cupboards run continuously as part of the extract system.

6.38 It will be necessary to have one or more microbiological safety cabinets and one or more fume cupboards available for use at all times, including weekends. Therefore local controls for the operation of any associated ventilation plant will also be necessary. Similarly, work in the Containment level 3 room must only be undertaken with all ventilation systems serving the room operating. Where "make-up" air is provided by mechanical ventilation, either from an independent system or from a main supply ventilation system, a supply air failure warning system should also be provided. If any safety enclosure or room extract system fails, the associated supply system must be capable of being shut down automatically or reduced by an appropriate amount to prevent pressurisation of the room and possible contamination of adjacent areas. (See also paragraph 6.43.)

6.39 The ventilation control systems for safety cabinets should incorporate a five minute delay timer to ensure that, under normal operation, the system will continue to run after work has finished to purge any remaining contaminants.

6.40 Where possible, extract duct routes should avoid passing through other fire compartments. But where this is unavoidable, the duct should be given appropriate fire resistance or be provided with fire dampers. Extract systems for microbiological safety cabinets and fume cupboards used for processes involving highly toxic and/or aggressive substances must not have fire dampers and ducts must, therefore, be provided with fire protection.

Ventilation of Containment level 3 laboratory

6.41 Ventilation of Containment level 3 laboratories should ensure that while working with pathogens a continuous air flow into the laboratory must be maintained by ducting the exhaust air from a microbiological safety cabinet to the outside air through a HEPA filter.

6.42 Provision should also be made for comfort factors, for example, fresh air and temperature control.

6.43 Because of the likelihood of an accidental spillage of infectious material or failure of the safety cabinet fan(s), secondary containment is required.

6.44 In most circumstances the inherent air-tightness of the room will suffice. In the exceptional circumstances that additional ventilation is required over and above that provided by the safety cabinet(s), secondary containment must be maintained. This can be achieved either by closing off any additional extract ventilation, or more economically by installing a HEPA filter at the extract. (A pre-filter will be essential to maximise the service life of the HEPA filter.)

6.45 It is desirable that the safety cabinet(s) and any separate extract can be switched off intermittently by the operator to reduce the frequency at which HEPA filters must be changed and to permit the sealing of the cabinet and room for fumigation if spillage occurs.

6.46 Safety cabinet fan(s) should be interlocked with general ventilation systems to maintain the desired air flow pattern at all times. Where separate supplementary extract is provided, the extract volume can be varied by the appropriate amount to compensate for stationary safety cabinet fan(s).

6.47 In laboratories which have a mechanical air supply system, the supply and extract systems must be interlocked to prevent positive pressurisation of the room in the event of failure of the extract fan. Ventilation systems must also incorporate a means of preventing reverse air flows.

6.48 The laboratory, including all duct work and services, must be sealable to permit fumigation. Ventilation controls for purging the space should be located outside the laboratory.

6.49 Further information concerning the ventilation requirements for Containment level 3 laboratories, with particular reference to existing buildings, is contained in DHSS Engineering Data DV3 [17].

Microbiological safety cabinets

6.50 The manufacture and installation of all microbiological safety cabinets must be in accordance with BS5726 [18] and the 'Code of Practice for the Prevention of Infection in Clinical Laboratories and Post-mortem Rooms' [19]. Further information on the selection and installation of these cabinets is contained in Hospital Equipment Information No 86 [20]. A Class 1 microbiological safety cabinet must be specified for routine work involving Group 3 pathogens.

6.51 Siting and installation are of particular importance because:

a. the protection afforded to the operator by the cabinet depends on a specific and stable unidirectional air flow through the open front;

b. the protection afforded to the environment by the cabinet depends on the high efficiency particulate air (HEPA) filters. The exhaust air should never be regarded as totally free from microbiological hazard.

6.52 Due to the HEPA filters, the discharge from safety cabinets is relatively clean. Discharge to outside provides additional safeguards by dilution of any penetrating materials in the event of filter failure. In view of the hazard involved it is usually preferable to provide short discharge ducts to atmosphere through a wall (or window) or through the roof. BS5726 [18] permits the installation of microbiological safety cabinets with integral fans provided that the extract ductwork can be kept short (less than 2 metres); such an installation however is likely to be noisy and is not recommended for installations in new buildings. Roof level discharge wherever practicable is preferred, provided that this does not result in extensive and complicated extract ducts, since it removes much of the uncertainty over air re-entering the building through ventilation inlets and/or windows. In such an installation the extract fan should be situated separate from the cabinet and close to the discharge outlet to maintain the duct under negative pressure.

6.53 Changing the filters on a safety cabinet is a potentially dangerous procedure and should only be carried out after fumigation: reference should be made to Public Health Laboratory Service Monograph Series No 6: 1974: Revised 1977 [21] and the "Howie" Code of Practice Appendix 9 [19].

6.54 Further information concerning the installation and commissioning of microbiological safety cabinets is contained in DHSS Engineering Data DV3 [17].

Fume cupboards

6.55 Factors which contribute to the effective performance of fume cupboards include an adequate volume of supply air and an effective exhaust system to promote the safe dispersal of waste products to atmosphere.

6.56 The air velocity through sash openings must be sufficient to prevent hazardous materials from entering the laboratory, whilst avoiding excess flow rates that interfere with the investigation in progress. Average face velocities should be between 0.5 and 1.0m per second, with a minimum at any point within 20 per cent of the average. The upper end of the range being applicable to the containment of materials of high toxicity. The design velocity must be maintained irrespective of whether the sash opening is varied or whether doors and windows are open or closed.

6.57 The possibility of a fire or explosion which may not be contained by a fume cupboard must always be considered. A fume cupboard should not, therefore, be sited in a position where exit to an escape route will necessitate passing directly in front of it.

6.58 Fume cupboard fans should be installed as near as possible to the termination of the duct, thus maintaining the maximum amount of ductwork at a negative pressure. In certain circumstances, a congested site for example, where there are adjacent buildings with opening windows, or where downdraught occurs, it may be necessary to increase the height of discharge ducts to achieve adequate dispersal. To optimise the dispersal of fumes, a collection duct and tall stack may be considered where there would otherwise be a requirement for a large number of separate stacks. The optimum height of the stack may have to be established by carrying out a wind tunnel test. Air flow modelling techniques are now available and may be considered as alternatives. Individual fume cupboard exhaust systems should discharge via non-return dampers into such a collection duct. The collection duct should have a large cross sectional area to minimise its effect on the individual exhaust systems. It should be open to atmosphere, up-stream of the first connection, and be designed to discharge a total air volume at least equal to the combined individual extract systems. Fume cupboards for certain processes, however, must have separate extract systems (see also paragraph 6.40). Individual fume cupboard extract systems, either discharging directly to atmosphere or into a collection duct, do not require duplex fans. A collection duct, however, is designed to provide dispersal of effluent for a number of individual extracts and should, therefore, have duplex fans with automatic change-over.

6.59 Further detailed guidance concerning the selection and installation of fume cupboards is contained in Health

Equipment Information No 86 [22]. BS7258 'Laboratory Fume Cupboards' published in 1990 in three parts, is now available [16].

Extract hoods

6.60 Hoods are required over some equipment for the extraction of toxic fumes, odours, heat and vapours. They should be designed to ensure satisfactory performance with the minimum air flow.

6.61 The air flow rate must be sufficient to ensure an adequate capture velocity in the vicinity of the process and a minimum hood face velocity of 0.2 m/sec will normally suffice. A compact arrangement of equipment, but with access for maintenance, will minimise the hood area and, hence, reduce the air volume necessary to achieve the optimum capture velocity.

6.62 Hoods required for the control of heat gain and vapours may be connected to the normal extract system when it is convenient to do so. Some guidance on the design of hoods is available in the CIBSE Guide Volumn B [23].

6.63 Very high temperatures are produced with the burning of nitrous oxide and acetylene in atomic absorption spectrometers. Heat damage can normally be avoided by designing the hood and extract system to ensure adequate dilution of the products of combustion. Provided flue gases are adequately diluted, the extract system may be connected to one of the main laboratory extract systems. But where non-corrosive ductwork materials are necessary, a separate discharge is preferred.

Laminar flow cabinets

6.64 Vertical laminar flow cabinets (BS5726 [18] Class II) may be required for media preparation. They operate by drawing air from the laboratory and discharging filtered air unidirectionally over the work space. They protect the media from contamination, but protection of the operator depends on the design of the cabinet and subsequent maintenance. Limitations on the use of Class II cabinets are given in 'Categorisation of Pathogens according to Hazard and Categories of Containment', Appendix A.

Ventilation of dissecting benches (histopathology)

6.65 For general requirements in this area see paragraphs 4.79 - 4.90. The ventilation should be arranged so that air flows towards dissecting benches from adjoining spaces. Local ventilation will be needed to limit the concentration of formaldehyde vapour within the breathing zones of the operator to the recommended Threshold Limit Value of 2ppm. The system parameters which are outlined in the following paragraphs were derived from tests on a model installation and are aimed at maintaining a concentration below 1ppm.

6.66 The dissecting position will usually be accommodated in a continuous run of benching which should not be more than 650mm from front to rear and which should be provided with a continuous upstand at the rear. Each dissecting position should have a linear extract grille mounted with its face flush with the upstand.

6.67 The bottom of the grille should be as close as practicable to the level of the working surface. For practical cleaning purposes, the minimum height of the bottom of the grille opening above the working surface is likely to be 75mm.

6.68 In practice a working zone 1.2m long should suffice at each dissecting position. It is recommended that the extract grille should also be 1.2m long and 150 mm high. For optimum extract performance, it should be mounted on a purpose-designed plenum box (incorporating guide vanes as necessary) to ensure that, as far as practicable, there is a uniform face velocity of not less than 1m/s along the total length, and across the full height, of the extract grille opening. The grille should be readily demountable to permit periodic internal cleaning of the plenum box and any guide vanes.

6.69 Filtration of the extract system is not considered to be necessary.

Ventilation of sanitary accommodation

6.70 A separate extract system will be required for sanitary facilities. A dual motor and fan unit with an automatic change-over facility should be provided to ensure that this accommodation is always maintained at a negative pressure when the department is in use.

Heat recovery

6.71 A substantial amount of energy is discharged through fume cupboards, safety cabinets and extract canopies to atmosphere. Consideration should be given to the recovery of some of this energy, where it is economic and safe to do so.

Ventilation controls

6.72 Supply and extract ventilation systems should include controls and indicator lamps in the plant room to confirm the operational status of each system. Alarms should be repeated in the works department. Controls will usually include those for temperature/time switching functions. Their selection should take account of the extent to which they can be linked to, or provided by, a building management system serving the whole hospital.

6.73 Where appropriate, the ventilation systems should be controlled by means of time-switches located within the department. Manual override facilities should be provided and they should be clearly marked with labels to define their function.

6.74 The supply and extract fans should be interlocked to ensure that the supply fan will not operate unless an air flow is established within the extract system.

6.75 All heater battery coils and filters should be provided with frost protection.

Space cooling – design principles

6.76 General areas, including office accommodation, staff room, library/seminar room and similar areas, should be naturally ventilated. Some laboratories, central wash-up, and similar areas subject to high equipment heat gains may require mechanical cooling to provide a comfortable environment for staff and to ensure satisfactory operation of equipment.

6.77 Generally, air cooling should be included where calculations show that, without an excessive number of air changes, internal temperatures are likely to rise more than about 3°C above external temperatures. In these circumstances, cooling should commence when the space temperature reaches 25°C.

6.78 Refrigeration plant should be of sufficient capacity to off-set equipment heat gains and maintain laboratory areas at a temperature which does not exceed the external shade temperatures by more than about 3°C.

6.79 Exceptionally, and overriding this policy, there will be a need to maintain temperatures within specified limits to prevent equipment failure. In these instances, temperature limits should be obtained from the equipment manufacturers.

Bench services

6.80 All laboratory bench sinks will require a cold water supply and drainage. Some may require a de-ionised water supply and/or hot water. Each laboratory will also require a basin with hot and cold water for clinical hand-washing. (See paragraphs 6.83–6.87.)

6.81 Some or all of the following gases may be required:

a. fuel gas;

b. compressed air;

c. vacuum;

d. nitrogen;

e. carbon dioxide;

f. hydrogen;

g. argon;

h. acetylene;

j. propane.

6.82 With the possible exception of fuel gas, these gases should be supplied from local cylinders (dedicated to this department) or, in the case of vacuum, derived from portable bench-mounted pumps (see paragraphs 6.92 – 6.100).

Hot and cold water services

6.83 Guidance concerning the design and installation of cold water supply pipework and distribution systems is contained in HTM 27 [24]. For frost protection purposes, and to prevent condensation staining decorative finishes, all cold water pipework, valves and flanges, should be insulated and vapour sealed.

6.84 To limit the risk of Legionella bacteria, the water services should be designed, installed, and commissioned in accordance with the recommendations in the DHSS Code of Practice[25].

6.85 The hot water supply should be taken from the general hospital calorifier installation at an outflow temperature of 60°C ± 2.5°C, and distributed to all outlets so that the return temperature at the calorifier is not less than 50°C. Outlet temperatures and fittings for wash-basins, sinks, and showers are shown on Activity Data A– and B–Sheets.

6.86 The hot water supply to laboratory areas should have separate sub-circuits incorporating appropriate back-syphonage protection.

6.87 Laboratory bench sinks and equipment must be supplied from a separate laboratory cold water storage system. This system may be supplied from the potable down service or the rising main.

Emergency shower

6.88 An emergency drenching shower should be provided at a stragetic position for use by staff, in the event of accidental spillage of acid or clothing fires. The floor below the shower should be graded and drain into a suitable gully.

Purified water

6.89 A limited supply of de-ionised water will be required for laboratory use and for the final rinse cycle of glassware washing machines. It should be produced in a central plant dedicated to pathology use. Small quantities of distilled water will also be required in some laboratories and should be produced locally using portable electrically operated automatic stills. Condensed steam from central boiler plant is not a suitable alternative.

6.90 The central de-ionisation plant should consist of purification modules appropriate to local needs. The final selection will largely depend upon the nature of the raw water supply, the aggregate demand and the purity level required. A reverse osmosis unit combined with ion exchange together with an appropriate storage capacity will normally provide the most efficient and economical installation. This size and location of plant and storage tank should be determined at an early stage to ensure that the required flow rates are obtained economically and efficiently with distribution pipework kept to a minimum.

6.91 Great care is required in the construction of the storage and distribution system to ensure that the purity of the water is not compromised. Distribution pipework and storage vessels should be manufactured from ABS (Acrylonitrile Butadiene Styrene) Class E or UPVC plastics and the system should have a fully automatic "dump" facility to ensure that water not of the required standard is discharged to drain.

Fuel gas

6.92 Fuel gas outlets will be required mainly in microbiology for heating inoculation loops. The installation should comply with BSCP331 [26] and the requirements of the Gas Safety Regulations 1972 [27].

6.93 Each fixed item of equipment should be connected via a safety cock of the drop-lever type or similar. Bench apparatus should be supplied via self-sealing bayonet sockets. Outlets for bunsen burners and fume cupboards may be of the serrated nose push-type, each must be controlled by a safety cock. Gas outlets must not be provided inside microbiological safety cabinets.

Pathology gases, compressed air and vacuum

6.94 Generally, all pathology gases should be piped, but small quantities may be supplied from portable cylinders, for example, acetylene at gauge pressures not exceeding 0.6 bar. In all cases however, prior approval must be obtained from the Health and Safety Executive (Explosives Inspectorate).

6.95 The greatest possible care must be taken in the construction of the pipe system for gases, both for the general and local bench services. The whole of the installation should be installed and tested by a specialist contractor. Further guidance is contained in HTM 22 [28] and any subsequent published amendments.

6.96 Plugged tee outlets for future change of use should not be provided, but the system should be readily accessible to modification and extension (see paragraph 6.14).

6.97 Guidance on acetylene gas installations is contained in WKO(78)3 [29] and WKO(80)13 [30].

6.98 Terminal units (outlets) of the type used for medical gases, medical compressed air and medical vacuum should not be used in the pathology laboratory.

6.99 Vacuum at minus 0.5 to 0.6 bar, using portable vacuum pumps, should be sufficient for most laboratory work and, therefore, a piped vacuum system is not required.

6.100 Oil free compressed air may be supplied from small local units provided exclusively for this department. A piped system is unnecessary.

Hot room

6.101 The hot room should be well insulated and maintained at $37^{0} \pm 0.5^{0}$c. The lockable door should have an internal safety release.

6.102 The design of the heating system should provide an even distribution of air, without stratification, within the space.

6.103 A recording thermometer, visible from outside the hot room, must be provided together with local and remote high/low temperature alarms.

Cold rooms and blood bank

6.104 The cold rooms should be maintained at a temperature of 5° ± 1°C. They should be well insulated and designed in accordance with BS2502 [31] and BS4376 [32]. The door should have an internal safety release. Ceiling mounted evaporators should provide low velocity air distribution without stratification and with sufficient capacity to allow a rapid temperature response.

6.105 Free-standing blood bank cabinets with a normal operating temperature of 5° ± 1°C should be purpose-designed in accordance with BS4376[32]. They should be capable of maintaining a uniform blood storage temperature in all parts of the cabinet and there should be no rise in cabinet internal temperature during the defrost cycle.

6.106 Refrigeration systems should incorporate duty and standby compressors with manual selection of duty compressor and automatic change-over, if the duty compressor fails. Air-cooled condensers should be located outside the building.

6.107 Each cold room and Blood Bank cabinet must have a tamper-proof temperature recorder mounted externally. It should incorporate a battery maintained audio/visual alarm with remote indication at the telephone exchange or other permanently manned station, to warn if the temperature rises or falls beyond a pre-set range. A pulsating lamp signal may be required to indicate when there has been a refrigeration system malfunction or a mains failure.

Sterilizers (steam)

6.108 Sterilizers are required for sterilizing media and apparatus and rendering discarded materials safe. Except in small laboratories where discard material can be processed for an extended period, for example, up to four hours, the single ended horizontal downward displacement autoclave manufactured in accordance with BS2646 [33] (under revision) has now been replaced by high performance multi-functional units conforming to BS3970 [34] (also under revision).

6.109 Two multi-functional units will normally be required. Each having a capacity of 0.4 cubic metres and the performance characteristics shown in the table on the next page.

6.110 Each sterilizer will require a peak steam supply of approximately 180 kg/hour at a pressure of 5-bar. This may be from a central supply, if conveniently available, or from an integral or local free-standing steam generator.

6.111 Automatic media preparation systems are also used for sterilizing microbiological culture media. They consist of two or three modules designed to provide controlled preparation, sterilization, cooling and dispensing of media with minimum intervention by the operator. A performance and safety specification for the autoclave module is available under reference STB 3A/85.12[35].

6.112 The sterilizer plant room must be adequately ventilated to offset heat generated by the plant and protected from frost during the silent hours. Additional space should be provided if separate steam generators and water treatment plant are to be installed.

6.113 Further guidance concerning the selection and installation of sterilizers is contained in HMT 10 [36].

Sterilizers (dry heat)

6.114 Electrically heated hot air sterilizers, each with an approximate capacity of 0.08m^3 and complying with HMT 10 [36], will be required for sterilizing laboratory glassware and hollow-ware.

Washing/drying machines

6.115 Infected laboratory equipment will require sterilizing before reuse. But washing/drying machines will also be required to ensure that other soiled glassware and hollow-ware are clean and microbiologically safe for subsequent handling. The machines, either in separate or combined form should be purpose-designed and the final rinse cycle should allow the use of de-ionised water. A minimum water pressure of 1–bar is usually required for the satisfactory operation of laboratory washing machines.

Waste disposal

6.116 Clinical waste which includes infected laboratory waste is defined in 'The safe disposal of clinical waste' [37]

which also provides guidance concerning methods of disposal. Essentially all infected waste must be autoclaved before disposal. Waste disposal units should be free-

Material	Temperature °C
Discard plastics	134
Discard glass and contained fluids	126-134
Media	(variable time and temperature)
Glassware	134
Fabrics (porous load cycle)	134

standing, complete with a solenoid valve to prevent operation unless a minimum flow of water is established, and permanently connected to the main drainage system. The branch drain should be as short as practical and its junction with the main drainage should be at a location where adequate dilution can be assured. The unit should incorporate pressurised flushing and cleaning of the waste hopper. Waste that is not miscible with water should be incinerated or consigned to the local authority/private contractor for disposal after it has been effectively treated.

ELECTRICAL SERVICES

General scope

6.117 The electrical installation includes:

a. main intake switchgear, local isolators and distribution boards;

b. lighting;

c. power (including supplies to ventilation plant);

d. earth bonding of extraneous metal work;

e. telephone wireways and wiring;

f. wireway for data links;

g. clocks;

h. fire alarms;

j. staff location.

6.118 For cost allowance purposes, the distribution of the services commence at their points of entry into the department.

6.119 The installations should comply in all respects with the current IEE Regulations for Electrical Installations [38] and conform to the requirements of HTM 7 [39].

6.120 Reference should be made to the Activity Data A-Sheets for the recommended levels of internal illumination, disposition of outlets for power, telephones, data links, clocks, etc., in individual spaces.

6.121 The point of entry for the electrical supply will be a switch-cupboard housing the main isolators and distribution equipment. This space will also be the distribution centre for subsidiary electrical services. Wherever possible, all equipment should be mounted at a height to give easy access from a standing position. The cupboard should be positioned so as to minimise the cost of cabling within the department.

Electrical installations

6.122 The electrical installation in occupied areas should be concealed using PVC insulated cable in screwed steel conduit or trunking. But in certain circumstances, mineral insulated metal sheathed cables may be necessary. Steel conduit and trunking wireways for communication and data systems should also be concealed wherever possible.

Electrical interference

6.123 Guidance concerning the avoidance and abatement of electrical interference is given in HTM14 [40] and fluorescent luminaires (lighting fittings) should comply with BS5394 [41].

6.124 Care should be taken to avoid mains borne interference and electrical radio frequency interference affecting computers and other electronic equipment used in pathology or elsewhere on the site.

Lighting

6.125 Practical methods of lighting the various functional spaces are contained in the CIBSE Lighting Guide [42]. Luminaires should be manufactured and tested in accordance with the requirements specified in the relevant sections of BS4533 [43]. Their location should afford ready access for lamp changing and maintenance, but with the overriding requirement that the recommended standard of illuminance is provided to the task areas.

6.126 It is essential that fluorescent lighting in consulting, examination, and venepuncture areas is derived from one of the recommended types of lamps having suitable colour rendering characteristics. Further guidance is contained in engineering Data Sheet DE 2.1–2.5 [44]. HN(85)20 (in Wales–CAW0(85)2) describes some high efficiency fluorescent lamps with good colour rendering properties which are also suitable for general use.

6.127 Control of lighting is normally by local switches and these should be provided in sufficient numbers to allow variation in lighting options. Such a facility is particularly important in large spaces where the level of daylight is not uniform and artificial lighting is likely to be needed for long periods in some areas remote from windows.

6.128 In areas where computer terminals are to be used, the lighting should be designed to avoid bright reflections on the screen and to ensure that the contents of the screen are legible. Further guidance can be found in CIBSE Technical Memoranda TM6 [45].

Socket-outlets and power connections

6.129 Sufficient 13 amp switched shuttered socket-outlets, connected to ring circuits or spurs, should be provided to allow all portable appliances likely to be used simultaneously to be individually supplied. The installation of twin outlets should be considered where these activities occur in juxtaposition. An above-average provision of socket-outlets will be required for bench services. A socket-outlet trunking system can provide flexibility and minimise disturbance when repositioning or adding outlets.

6.130 Domestic cleaning appliance flexible leads are assumed to be nine metres long. Socket-outlets, usually in corridors, should be provided to enable such machines to operate over the whole area of the department.

6.131 Fixed appliances rated up to 13 amps should be permanently connected to double pole switched spur boxes and fused as required. Appliances rated in excess of this load, or those requiring a three-phase supply, should be permanently connected to separate final circuits from fuse-boards and independently switched at a local isolator of appropriate rating.

6.132 Local switches, or other means of electrical isolation, should be provided adjacent to plant and equipment to ensure the safety of operators and maintenance staff.

6.133 Ventilation equipment and automatically operated equipment should be provided with indicator lights to show when the equipment is energised. Indicators should be incorporated in the control panel of the apparatus, in the control switch, or in the outlet from which the apparatus derives its supply.

6.134 The electrical supply connections to electro-medical equipment should comply with BS5724[46]. To avoid corruption of input data, some equipment may require automatic disconnection, with manual reset, following mains failure. Other computer-controlled analytical equipment may require an uninterruptable power supply from a static inverter of appropriate capacity.

Emergency electrical supplies

6.135 Guidance concerning the provision of emergency electricity supplies is contained in HTM 11[47]. Safety lighting in accordance with HTM 11[47] and BS5266[48] should be provided on primary escape routes.

Staff location system

6.136 If this accommodation is located on a hospital site, it may be appropriate to extend the staff location system to this department. Guidance on these systems is contained in HTM 20[49].

Telephones

6.137 Central telephone facilities for internal and external calls should be extended to serve this department where indicated on Activity Data Sheets. Telephones will normally be of desk pattern but wall mounted instruments, and instruments to provide a "hands off" loudspeaking facility, may be required in some areas. Wiring should terminate at each extension point in a standard line jack unit.

6.138 Further guidance on the provision of telephone services, including internal cabling distribution and handsets, is contained in HBN 48[50].

Wireways for data links

6.139 Wireways for data links should be provided within this department. Normally the cables can be accommodated in the communication trunking. However, separate conduits from the trunking to terminal positions, complete with outlet boxes and temporary blanking plates, should also be provided.

Electric clocks

6.140 Clocks should operate in conjunction with a master impulse clock system. Where sweep second hands are required, they may be provided by an integral synchronous motor which may be wired to an adjacent lighting circuit.

Lightning protection

6.141 Protection against lightning should be provided in accordance with HTM 7[39], HSE Data Sheet DB2[51] and BS6651[52].

INTERNAL DRAINAGE

General scope

6.142 The primary objective is to provide an internal drainage system that uses the minimum of pipework and remains water and air-tight at joints and connections, but is sufficiently ventilated to retain the integrity of water seals.

6.143 Effluent discharged from a pathology laboratory may be highly pathogenic and should, therefore, be routed to avoid any risk of cross-infection from blockages affecting other accommodation, particularly the more sensitive departments, for example, ITU, operating theatres, catering etc. The drainage may also contain chemicals and should, therefore, be designed for maximum dilution. This can be achieved by ensuring that frequently-used large volume appliances, glassware washing machines for example, are located upstream and by the provision of large capacity catch-pot receivers where appropriate.

6.144 The drainage system must be independently connected to the main drainage system at a point where further dilution can be ensured and as far downstream as is practical. Liaison with the statutory authority will be necessary to agree maximum discharge volume and method of connection to main services.

6.145 The designer should familiarise himself with the types of effluent produced by specialist equipment and ascertain from the client the effect that mixing of the various chemical discharges may have upon the drainage system.

6.146 Drainage pipework contained within ducts should be located where easy access for inspection and maintenance is possible. Access for cleaning should be provided in positions which will result in the minimum of disturbance to laboratory staff and, where possible, above the appliance flood level, for example, above rim level of the appliance so that the spillage of contaminated effluent can be minimised.

6.147 If radioactive effluent is to be discharged, the requirements for catch-pot recovery, dilution and maintenance of the drainage system should be discussed and agreed with the Radiological Protection Adviser before the design is finalised. Further information is contained in Engineering Data Sheet NZ1.1[53].

6.148 Autoclaves, except those used for the decontamination of infected material, glassware washing machines, and refrigerators should not be connected directly to the drainage system, but should have some form of air gap to prevent the ingress of bacteria.

6.149 The sterilizer for discarded material must be connected to the drain via a vented break tank and trap. The break tank should be vented outside the building, the vent termination above roof level clear of any ventilation inlet or window, etc. The trap should be positioned between the break tank and connection to the drainage system.

6.150 Floor gullies can become contaminated and should, wherever possible, be omitted or reduced to a minimum.

6.151 Metal pipework is not, in general, suitable for use in pathology laboratories, either for branch drains servicing individual sinks or equipment, or for any other local position where a blockage could result in an aggressive effluent backing up. In particular, copper and lead have given trouble with effluents containing either azide or mercury compounds. Glass, poly-propylene, and other plastics can all give good service, depending on the chemical characteristics and temperature of the fluids discharged and the arrangements for fixing and supporting the drain.

6.152 Borosilicate glass pipework for both waste and drainage is suitable for handling all types of chemical effluent likely to be met in pathology laboratories, as well as boiling water from sterilizers. However, it requires specialist installation and is not easily modified or replaced.

Design parameters

6.153 General design guidance is contained in the relevant British Standards and Codes of Practice, including BS5572[54], and the current Building Regulations. Recommendations regarding spatial and access requirements for public health engineering services are given in HSE Data Sheet EA5[55].

6.154 The gradient of branch drains should be uniform and adequate to convey the maximum discharge to the stack without blockage. Practical considerations such as available angles of bends/junctions and their assembly, as well as space considerations, usually limit the minimum gradient to about 1:50 (20mm/m). For larger pipes, l00mm diameter for example, the gradient may be less, but they will require workmanship of a high standard if adequate self-cleansing flow is to be maintained. It is not envisaged that pipes larger than 100mm diameter will be required within this department.

Operational considerations

6.155 Unusual and difficult maintenance problems can arise because of user interference and abuse. For example, the disposal of paper towels into WCs after hand-washing, or after their misuse for some other purpose, is a frequent cause of blockage, particularly in long branches laid to low gradients. Adequate provision of disposal receptacles or, where appropriate, the installation of warm-air dryers can help to mitigate this problem.

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7.0 Cost information

7.1 For all types of health buildings it is clearly of vital importance that building and running costs should be kept as low as possible consistent with acceptable standards. Within this general context Building Notes provide a synopsis of accommodation for health buildings which the Department, in conjunction with the National Health Service, recommends for the provision of a given service.

Works cost

7.2 To prepare an estimate of the works cost for a scheme, reference should be made to the `Capricode Health Building Procedures Manual' (Chapter 1, Stage 1, Annex 1.c). The total cost allowance for a scheme is derived by aggregating the cost of the functional units, Essential Complementary Accommodation and Optional Accommodation and Services as appropriate to the particular scheme.

7.3 The cost allowance covers the building and engineering guidance set out in this Note. The costing of the functional units assumes that they will be incorporated into a whole hospital to form a complete department.

Functional unit

7.4 The functional unit for this Note is:

District pathology services department

The department is the base for the district pathology services and the cost allows for the following functions: chemical pathology, haematology, histopathology and microbiology together with the necessary support services. The rooms and spaces used for costing the functional unit are shown in the schedules of accommodation at the end of this Chapter.

Dimensions and areas

7.5 In determining spatial requirements, the essential factor is not the total area provided but the critical dimensions, ie. those dimensions critical to the efficient functioning of the activities which are to be carried out. To assist project teams in preparing detailed design solutions for the rooms and spaces, some studies have been carried out to establish dimensional requirements in the form of critical dimensions. The results of these studies appear as ergonomic diagrams in the Appendix of this Note and in Health Building Note 40–`Common Activity Spaces'.

7.6 For development planning and at the earliest stage of a design it may be convenient for designers to have data available which will enable them to make an approximate assessment of the sizes involved. For this reason the areas prepared for the purpose of establishing the cost allowances are included at the end of this Chapter.

7.7 It is emphasised that the areas published **do not** represent recommended room sizes, maximum or minimum allowances, nor are they to be regarded in any way as specific individual entitlements.

Circulation

7.8 Space for circulation, which includes allowances for planning provision, engineering zone and partitions, has been added to each functional unit.

Communications

7.9 Staircases, lifts and plant rooms, with the exception of electrical switchrooms and the plant room for the autoclaves, are not included in the cost allowances. Corridors within the department, but not any linking it with other departments, are included in the allowances.

Essential Complementary Accommodation

7.10 This comprises activity spaces which are essential to the running of the unit but which in certain circumstances may be available in a convenient location elsewhere. The amount of Essential Complementary Accommodation (ECA) which will need to be provided as part of an individual project will therefore vary according to the extent of the provision available elsewhere. The ECA costed in this Note are listed in the schedules at the end of this Chapter.

7.11 The following ECA discussed in this Note has not been costed:

a. external gas cylinder store;

b. external flammable goods store.

Cost allowances for these spaces are provided for in HBN 29–`Accommodation for Pharmaceutical Services'.

Optional Accommodation and Services

7.12 Where appropriate this Note draws attention to alternative ways of providing services or facilities, including the likely cost implications. This information will allow project teams to select the solution which is most suitable to their needs. The Optional Accommodation and Services costed in this Note are listed in the schedules at the end of this Chapter.

Engineering space

7.13 The cost allowances provide for an engineering zone adjacent to external walls and for small vertical ducts. The space is included in the schedules as part of the circulation provision.

Engineering services

7.14 The following engineering services as described in Chapter 6, and amplified in the Activity Data, are included in the cost allowance. Primary engineering services are assumed to be conveniently available at the boundary of the department.

a. **Mechanical services**

LPHW radiator heating system including thermostatic radiator control.

Mechancial supply and/or extract ventilation system to meet functional requirements in areas such as:

laboratories containing safety cabinets, fume cupboards, extract hoods, or bench extract systems;

media preparation, wash-up and autoclave areas;

areas subject to high equipment heat gains (cooling to the latter is also included).

Separate extract ventilation system for sanitary facilities.

An appropriate proportion of the central air handling and treatment plant, refrigeration plant, and associated control is included.

Hot and cold water service, excluding calorifiers and tanks. Purified water service, including plant and tanks. Fire hosereel installation.

Compressed air (units within the department), fuel and pathology gases.

Steam and condensate.

Thermal insulation.

b. **Electrical services**

Departmental distribution switchboard.

General and task lighting. Fluorescent, safety and emergency luminaires.

Socket-outlets and other power supplies for fixed and portable equipment.

Standby lighting and power requirements. Safety lighting for escape routes.

Impulse clock system.

Fire, security, Blood Bank, and hot and cold room alarm systems.

Wireways, wiring and line jack units for telephone extensions.

Conduits from trunking to data link terminals.

Staff location system.

Equipotential bonding as required.

c. **Equipment (Group 1)**

Two autoclaves (0.4m^3).

Two dry heat sterilisers (0.08m^3).

Four microbiological safety cabinets (Class 1).

One microbiological safety cabinet (Class 2).

Two fume cupboards.

One washer/dryer.

Three cold rooms.

One hot room.

Four Blood Banks.

O.6m^3 double door;

0.3m^3 single door;

0.6m^3 pass through;

0.1m^3 laboratory.

De-ionised water plant.

Two waste disposal units.

Schedules of accommodation

Paragraph no.	Activity space	Space area sq.m.	Qty.	Total area sq.m.
Chemical pathology department				
4.51	Specimen reception and despatch	27.00	1.0	27.00
4.52	General laboratory area	77.00	1.0	77.00
4.54	Special laboratory area	43.00	1.0	43.00
4.59	Laboratory for office - 2 spaces	14.50	2.0	29.00
4.59	Office - Type A	10.00	4.0	40.00
4.59	Secretarial office	8.00	1.0	8.00
4.48	Cold room	9.00	1.0	9.00
4.56	Chemical store and preparation	14.00	1.0	14.00
4.45	Laboratory store	7.50	1.0	7.50
		Nett total		254.50
		Circulation etc		91.50
		Total		**346.00**
		Departmental area		345 sq.m.
Haematology department				
4.62	General laboratory area	80.50	1.0	80.50
4.66	Special laboratory area	30.00	1.0	30.00
4.69	Blood transfusion - reception	9.00	1.0	9.00
4.74	- grouping	34.00	1.0	34.00
4.75	- cross-matching	35.00	1.0	35.00
4.76	Laboratory for office - 1 space	8.00	1.0	8.00
4.76	- 2 spaces	14.50	1.0	14.50
4.76	Office - Type B	11.50	4.0	46.00
4.76	Secretarial office	8.00	1.0	8.00
4.48	Cold room	9.00	1.0	9.00
4.45	Laboratory store	7.50	1.0	7.50
		Nett total		281.50
		Circulation etc		101.50
		Total		**383.00**
		Departmental area		385 sq.m.

Paragraph no.	Activity Space	Space area sq.m.	Qty.	Total area sq.m.
Histopathology department				
4.85	General laboratory area	41.50	1.0	41.50
4.89	Special histopathology laboratory	13.00	1.0	13.00
4.79	Specimen processing and storage	38.50	1.0	38.50
4.92	Cytopathology - processing	23.50	1.0	23.50
4.95	- screening	26.50	1.0	26.50
4.98	Laboratory for office - 1 space	8.0	1.0	8.00
4.98	- 2 spaces	14.50	1.0	14.50
4.98	Office - Type B	11.50	3.0	34.50
4.98	Secretarial office	8.00	1.0	8.00
4.97	Chemical store and preparation	13.00	1.0	13.00
4.91	Slide and block store	7.50	1.0	7.50
4.45	Laboratory store	7.50	1.0	7.50
		Net total		236.00
		Circulation etc		85.00
		Total		**321.00**
		Departmental area		320 sq.m.
Microbiology department				
4.101	General laboratory area	74.00	1.0	74.00
4.110	Containment level 3 room	25.00	1.0	25.00
4.111	Bacterial/Viral/Antibiotic section	43.50	1.0	43.50
4.114	Blood culture room	18.50	1.0	18.50
4.125 b	Media preparation area	29.00	1.0	29.00
4.125 c	Media/Plate pouring area	13.50	1.0	13.50
4.128	Laboratory for office - 1 space	8.00	2.0	16.00
4.128	Office - Type B	11.50	3.0	34.50
4.128	Secretarial office	8.00	1.0	8.00
4.126	Hot room	9.00	1.0	9.00
4.45	Laboratory store	7.50	1.0	7.50
4.48/4.127	Cold room	9.00	1.0	9.00
4.125a	Autoclaves/Central wash-up	47.50	1.0	47.50
		Net total		335.00
		Circulation etc		120.50
		Total		**455.50**
		Departmental area		455 sq.m.

Paragraph no.	Activity Space	Space area sq.m.	Qty.	Total area sq.m.
Shared accommodation				
4.5	Reception	12.00	1.0	12.00
4.6	Main waiting	19.50	1.0	19.50
4.8	Venepuncture room	9.00	2.00	18.00
4.8	Consulting/Examination	15.50	1.00	15.50
4.11	Specimen WC	4.00	1.00	4.00
4.11	WC/Wash	2.00	2.00	4.00
4.12	Specimen reception	15.00	1.00	15.00
4.16	"Out-of-hours" reception	1.50	1.00	1.50
4.17	General office	21.00	1.00	21.00
4.19	Bulk store/Storekeeper	60.00	1.0	60.00
4.23	Minor equipment maintenance	9.00	1.0	9.00
4.24	Disposal holding	4.00	2.0	8.00
4.26	Cleaners' room	7.00	2.0	14.00
4.28	Computer room	12.00	1.0	12.00
4.29	Staff changing	26.50	2.0	53.00
4.30	Protective clothing store	1.00	2.0	2.00
4.31	Staff WC/Wash	2.00	10.0	20.00
4.32	Staff room	51.00	1.0	51.00
4.34	Seminar room/Library	37.00	1.0	37.00
4.37	Duty staff - bedroom	7.50	2.0	15.00
4.37	- shower/WC	6.00	1.0	6.00
6.121	Electrical switch room	6.00	2.0	12.00
		Net total		409.50
		Circulation etc		147.50
		Total		**557.00**
		Departmental area		555 sq.m.
Essential Complementary Accommodation				
4.21	Gas cylinder store	27.50	8.50	36.00
4.22	Flammable food store	9.50	3.00	12.50
4.129	Control of Infection nurse's office	10.00	3.50	13.50

Optional accommodation and services

Paragraph no.	Activity Space	Space area sq.m.	Circ. etc. sq.m.	Total area sq.m.
4.131	Office - Type A	10.0	3.50	13.50
4.131	- Type B	11.50	4.00	15.50
4.131	Laboratory for office - 1 space	8.00	3.00	11.00
4.131 b	Consulting/Examination room	15.50	5.50	21.00
	Space for second person:			
4.131 d	Office - Type A	4.00	1.50	5.50
4.131 d	Office - Type B	4.50	1.50	6.00
4.131 d	Laboratory for office	6.50	2.50	9.00
4.131 e	Secretary	5.00	2.00	7.00

8.0 Activity Data

8.1 "Activity Data" is an information system developed to help project and design teams by defining the users' needs more precisely. This information constitutes the computerised Activity Data Base, first issued to Health Authorities in England and to the Health Departments in Scotland, Northern Ireland and Wales in 1989, and subsequently up-dated twice yearly. It comprises three types of information sheet: Activity Space Data Sheets (known as A-Sheets), their supporting Activity Unit Data Sheets (known as B-Sheets) and A-Sheet component listings (known as D-Sheets).

8.2 A-Sheets record in more detail than is described in this Note each task or activity that is performed in a particular activity space (which may be a room, space, corridor or bay) together with environmental conditions and the technical data necessary to enable the activities to be performed. Each A-Sheet also contains a list of the titles and code numbers of the relevant B-Sheets.

8.3 B-Sheets provide narrative text and graphics to scale relating to one activity. They show equipment fitted or supplied as part of the building, and the necessary engineering terminals. There are also "component B-Sheets" which show a range of particular components rather than an activity.

8.4 D-Sheets provide information about the total quantities of components (excluding those in Group 4 - see paragraph 1.15) extracted from all B-Sheets selected for inclusion in an individual A-Sheet.

8.5 Activity Data is only available in the form of magnetic media, but this may be used to generate paper copies where required.

8.6 Further information about the use and preparation of Activity Data can be found in the `Guide to `A' and `B' Activity Data Sheets and their use in Health Building Schemes' issued to Health Authorities with EL(89)MB/19 (WHC(89)18 in Wales). Health Authorities may obtain additional copies of the Guide and an explanatory video tape from NHS Estates, Room 540, Euston Tower, 286 Euston Road, London NW1 3DN.

Activity Data applicable to this Note

8.7 The A-Sheets recommended for the activity spaces described in this Note are either new sheets, amended ones or selected from existing sheets. A-Sheet code numbers are given at the end of this Chapter.

8.8 Further Activity Data Sheets may be selected, or drawn up by project teams to their own requirements, for any services not described in the Note or included in the list. Members of project teams are advised to contact their Activity Data Co-ordinator/Welsh Office for information and advice about the selection of activity data, at an early planning stage.

In order to ensure consistent and economic provision, variations from the A-Sheets recommended for the spaces covered in this Note should be considered only where it has been decided that the function of a space will differ substantially from that described.

Note. The Activity Data A-Sheets may not carry a title identical to the activity spaces detailed in this Note. Use of the appropriate A-Sheet code number will, however, result in the correct activity space being accessed.

Activity space	A-Sheet Code no.	Para no. in HBN
Chemical pathology department		
Specimen reception and despatch	L0102	4.51
General laboratory area	L0111	4.52
Special laboratory area	L0112	4.54
Laboratory for office - 2 spaces	L1101	4.59
Office - Type A	L1104	4.59
Secretarial office	M1309	4.59
Cold room	L1103	4.48
Chemical store and preparation	L0113	4.56
Laboratory store	W0601	4.45
Haematology department		
General laboratory area	L0402	4.62
Special laboratory area	L0411	4.66
Blood transfusion - reception	L0502	4.69
- grouping	L0503	4.74
- cross-matching	L0504	4.75
Laboratory for office - 1 space	L1101	4.76
- 2 spaces	L1101	4.76
Office - Type B	L1105	4.76
Secretarial office	M1309	4.76
Cold room	L1103	4.48
Laboratory store	W0601	4.45
Histopathology department		
General laboratory area	L0801	4.85
Special histopathology laboratory	L0802	4.89
Specimen processing and storage	L0803	4.79
Cytopathology - processing	L0901	4.92
- screening	L0902	4.95
Laboratory for office - 1 space	L1101	4.98
- 2 spaces	L1101	4.98
Office - Type B	L1105	4.98
Secretarial office	M1309	4.98
Chemical store and preparation	L0804	4.97
Slide and block store	L0805	4.91
Laboratory store	W0601	4.45
Microbiology department		
General laboratory area	L0302	4.101
Containment level 3 room	L0311	4.110
Bacterial/Viral/Antibiotic section	L0312	4.111
Blood culture room	L0313	4.114
Media preparation area	L0314	4.125 b
Media/Plate pouring area	L0315	4.125c
Laboratory for office - 1 space	L1101	4.128
Office - Type B	L1105	4.128
Secretarial office	M1309	4.128
Hot room	L1102	4.126
Laboratory store	W0601	4.45
Cold room	L1103	4.48/ 4.127
Autoclaves/Central wash-up	L1125	4.125a

Activity space	A-Sheet Code no.	Para no. in HBN
Shared accommodation		
Reception	J0606	4.5
Main waiting	J1109	4.6
Venepuncture room	C1403	4.8
Consulting/Examination	C0217	4.8
Specimen WC	V1403	4.11
WC/Wash	V1106	4.11
Specimen reception	L1121	4.12
"Out-of-hours" reception	L0505	4.16
General office	J0606	4.17
Bulk store/Storekeeper	W1427	4.19
Minor equipment maintenance	L1123	4.23
Disposal holding	Y0612	4.24
Cleaners' room	Y1211	4.26
Computer room	M0405	4.28
Staff changing	V0623	4.29
Protective clothing store	M1527	4.30
Staff WC/Wash	V1010	4.31
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Appendix 1

Critical dimensions

Introduction

1. Critical dimensions are those dimensions which are critical to the efficient functioning of an activity; thus the size of components, their position and the space around them may all be critical to the task being performed. Guidance on these dimensions for a particular activity is provided in the form of **component-user data sheets**. These illustrate components, ie equipment, furniture and fittings, and provide ergonomic data on the space required for users to move, operate or otherwise use the component; information about the component, eg fixing heights, and the users, eg reach, is also provided. Component-user data sheets thus complement the information given on Activity Data B-Sheets (see Chapter 8).

2. This Appendix contains sheets relevant to this Note. In addition, ergonomic data common to the design of a number of departments is contained in the Health Building Note 40 – 'Common Activity Spaces', to which reference should also be made.

Component dimensions

3. These relate to the size and position of components as follows:

a. sizes of components are shown thus

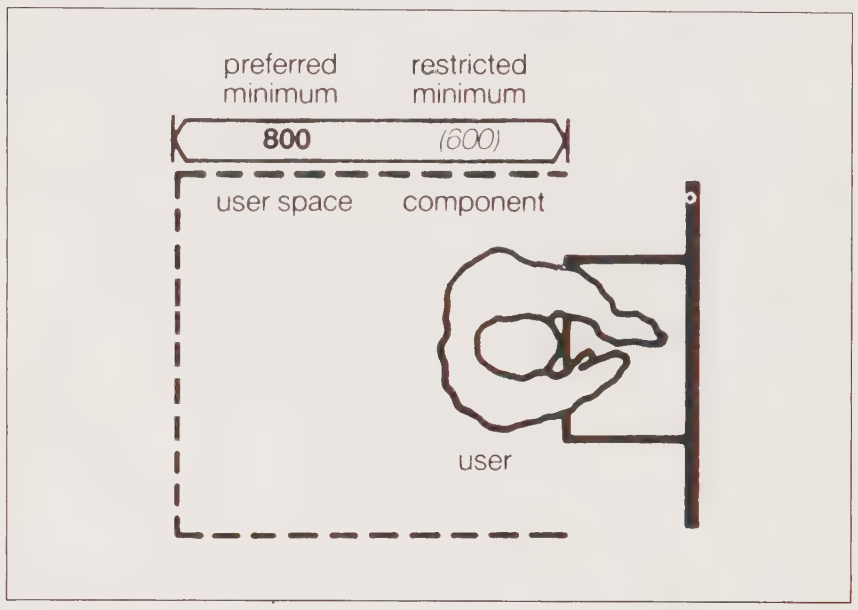
b. preferred component fixing heights are shown as height above floor level thus

1000
1000-1300

(In some cases an acceptable range of fixing heights is also given in italics.)

Activity dimensions

4. Activity dimensions define the user space, which is the minimum space required to perform an activity. Two types of activity dimensions are given:

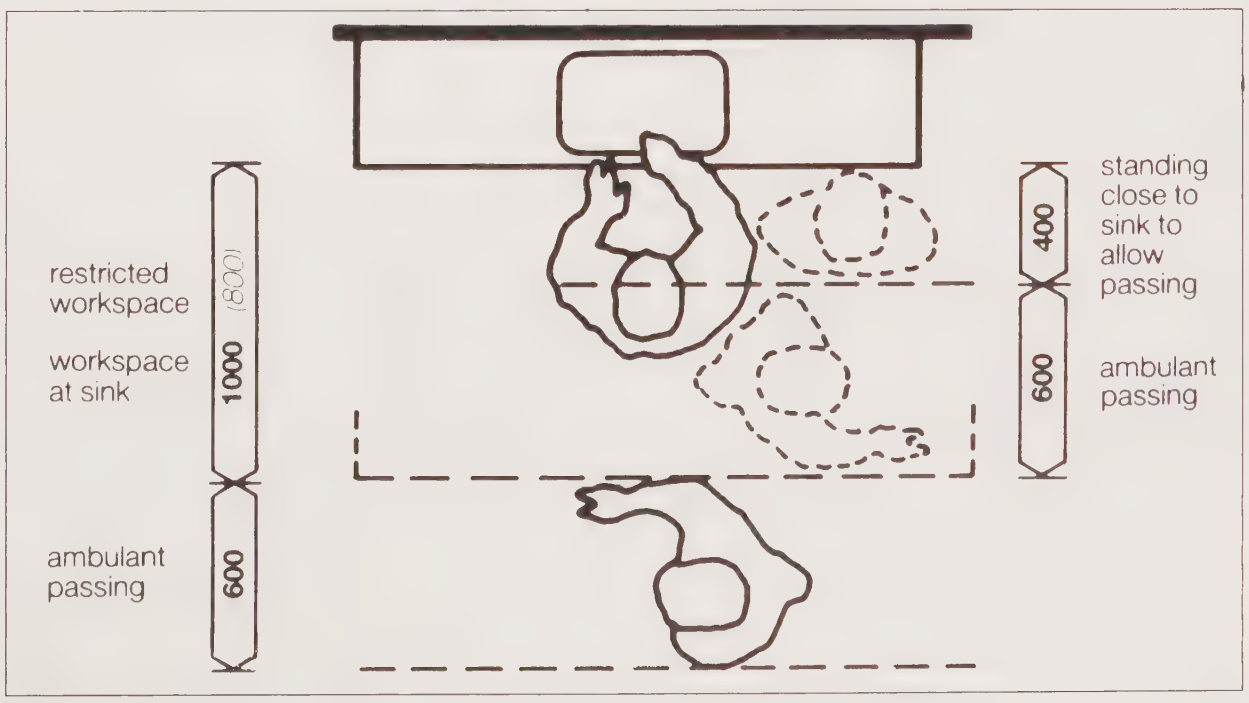


a. preferred minimum - this defines the minimum space required to carry out an activity efficiently and is shown in bold type;

b. restricted minimum - this will only allow the activity to be performed at the expense of the user experiencing some difficulty. It is not recommended for general application but may be appropriate when considering the overlapping that can be allowed when two user spaces are adjoining.

Selection of activity dimensions

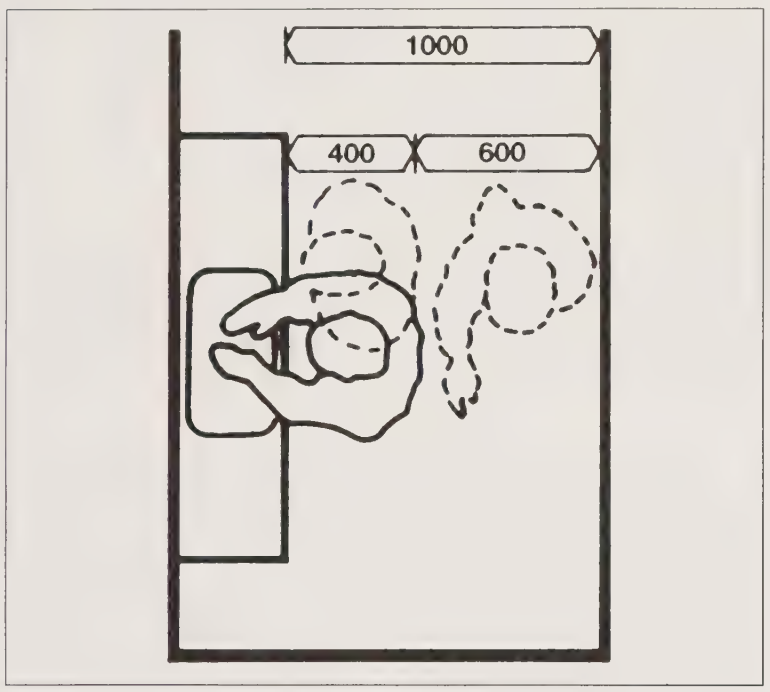
5. When using component-user data sheets to design activity space layouts, selection of the appropriate activity dimensions is essential for economy and efficiency. Selection should be based on careful consideration of the frequency, duration, timing and importance of the activities and also the number of people involved. A typical example of the use of a sink showing activity dimensions provided by the component-user data sheet is shown below.



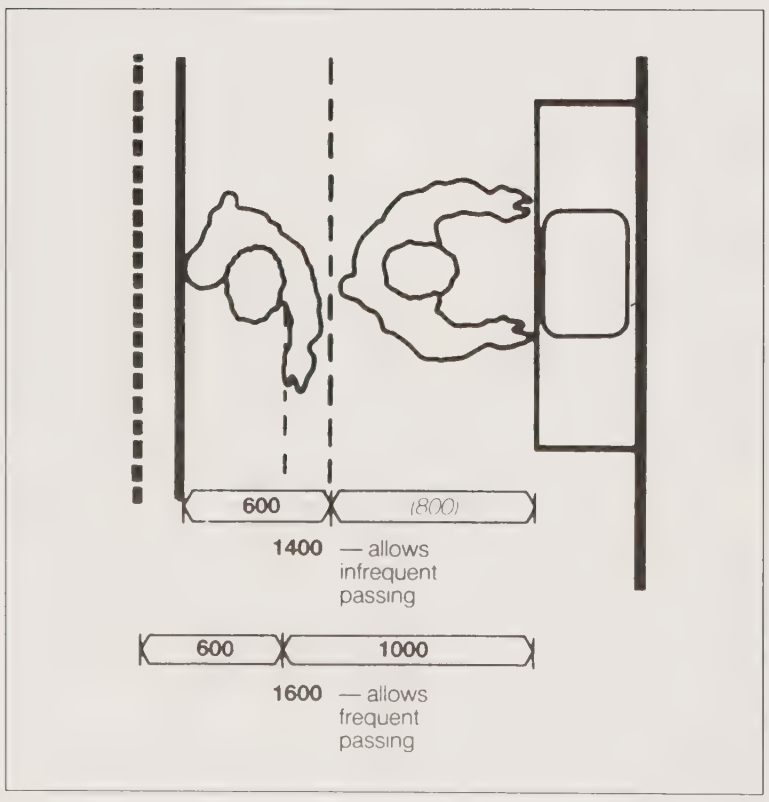
Examples

6. The following worked examples show the sink being used in three different situations and show how the appropriate dimensions would be selected but do not necessarily relate to this particular building guidance. These examples have been simplified and additional factors such as the movement of mobile equipment may also be critical.

a. if the room is normally occupied by one person only the 1,000 workspace dimension may be applicable. An (800) restricted dimension should not be used as this dimension is only applicable where two user spaces are adjoining, not where an individual user space is bounded by a wall or solid obstruction. If the person using the sink stops work and stands close to the sink, 1,000 is also sufficient space to allow a second person to pass, ie 600 + 400.

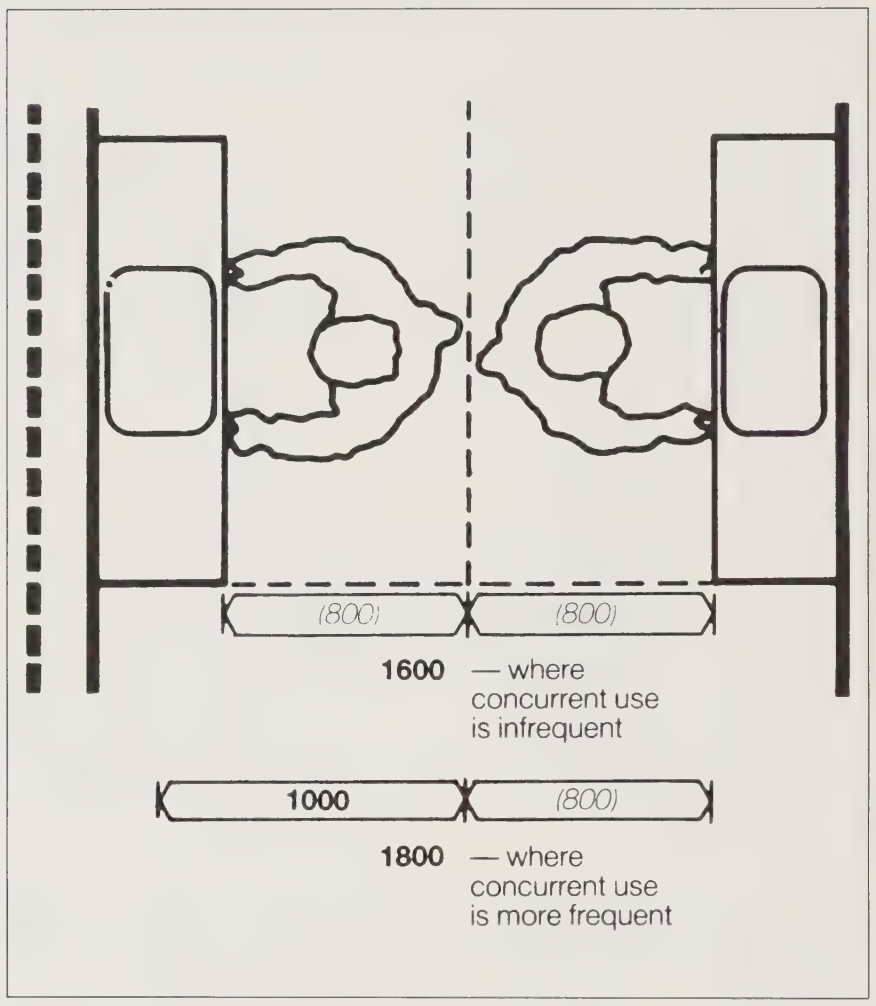


b. if space is required to allow a person to pass, without the user of the sink stopping work, then the 600 passing dimension is added to the workspace dimension. If passing is infrequent then temporary restriction of the sink user's space may be acceptable; this gives an overall dimension of 600 + (800) = 1,400. If passing is frequent and restriction of the sink user's space is not acceptable the overall dimension is 600 + 1,000 = 1,600



c. where space has to be provided to enable two sinks to be used concurrently the overall dimension between sinks will be the sum of the workspace dimensions, eg if concurrent use is infrequent and of short duration then (800) + (800) = 1,600 may be acceptable. Alternatively 1,000 + (800) = 1,800 allows the full workspace for one sink user and restricted space for the second user, where concurrent use of the sinks is more frequent.

Note. The passing of a third person between the two sink users may also be critical in this example. Where the sinks are staggered 1,400 may be acceptable as in example (b).



List of ergonomic drawings

1. Laboratory bench - staggered working
2. Laboratory bench - back to back working

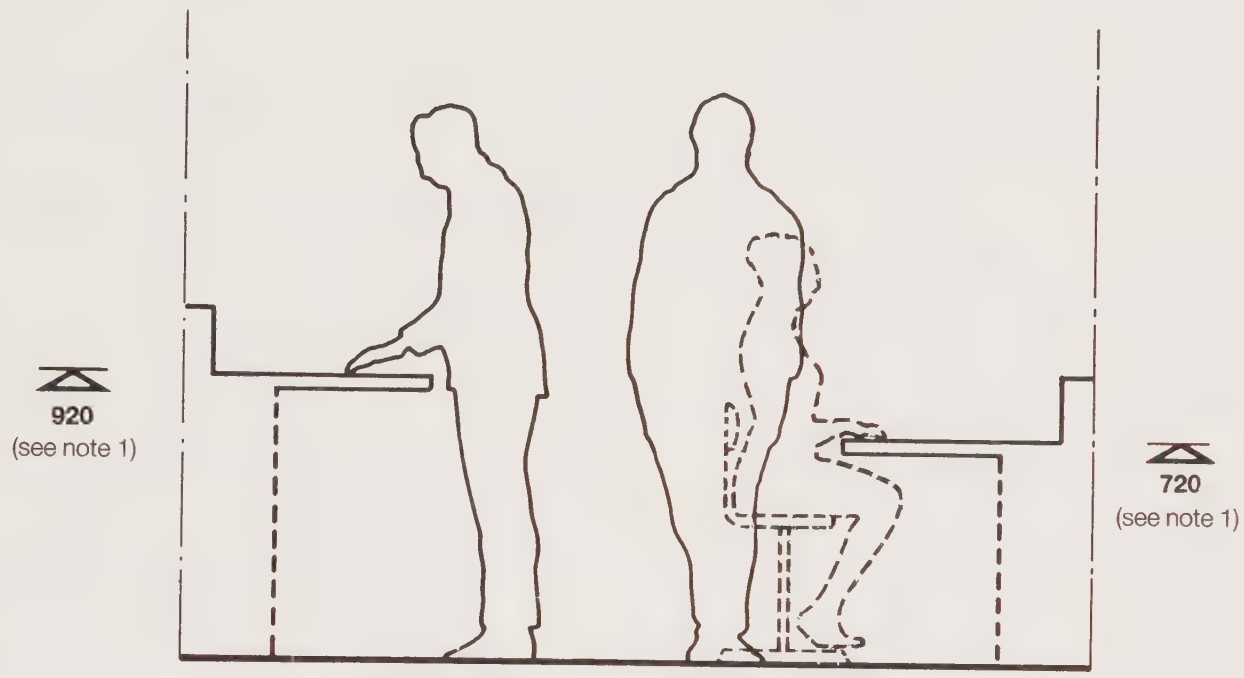
Activities:
General laboratory work.

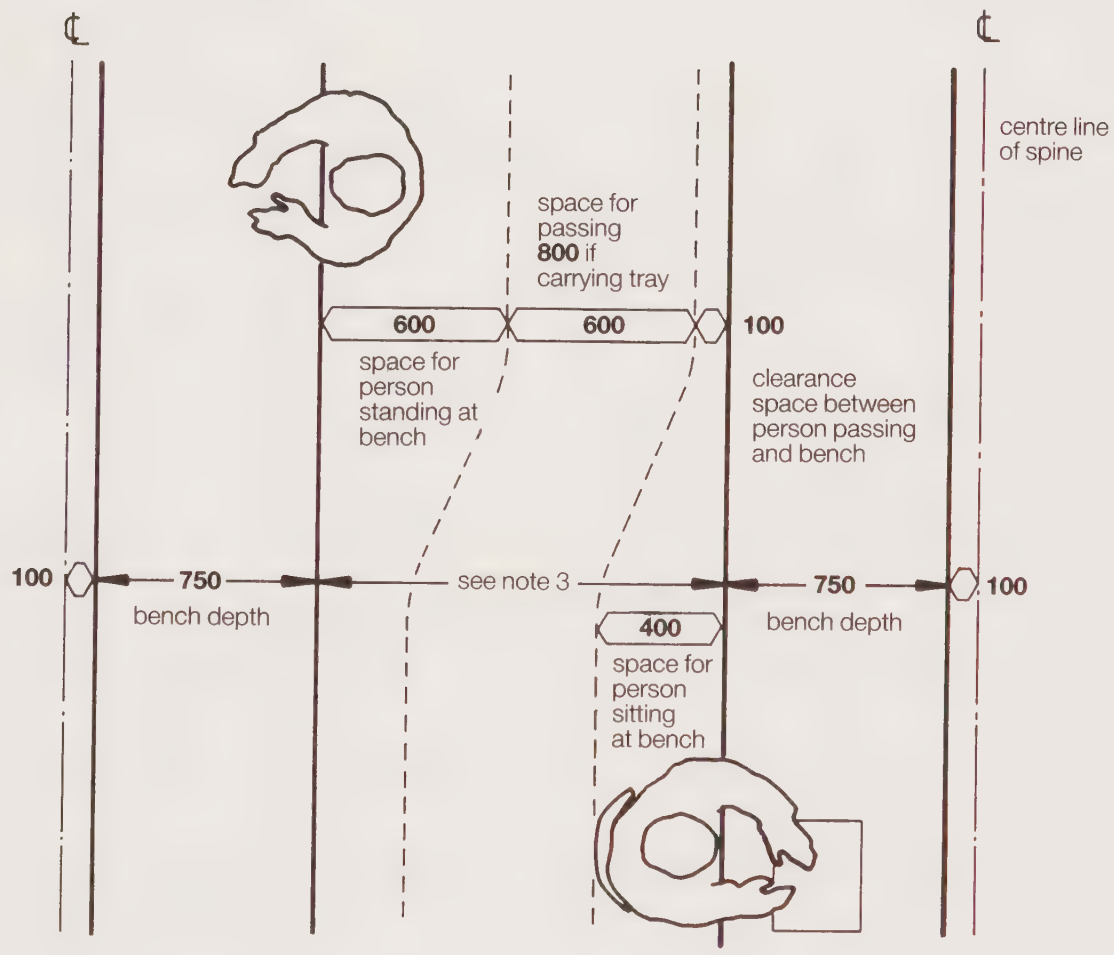
DH **Ergonomic Data Bank**
Component-User data sheet, not to scale

Laboratory bench

(Staggered working)

Users:
Laboratory staff





1350 *(1300)*

Preferred minimum: *Restricted minimum (not recommended for general use: see explanatory notes)*

Notes

1. The recommended bench height for laboratory work - when staff are standing or sitting on high adjustable seats - is **920** mm and for sitting work is **720** mm: This should allow for the placing of both removable underbench units and refrigerators beneath the bench.

2. The preferred clear bench depth is **750** for both manual work and locating bench mounted equipment: This dimension may be varied to suit individual needs. For flexible working however a standard dimension should be used through out the department.

3. If staff working positions are staggered, which often happens, the clear distance required between benches may be reduced as shown.

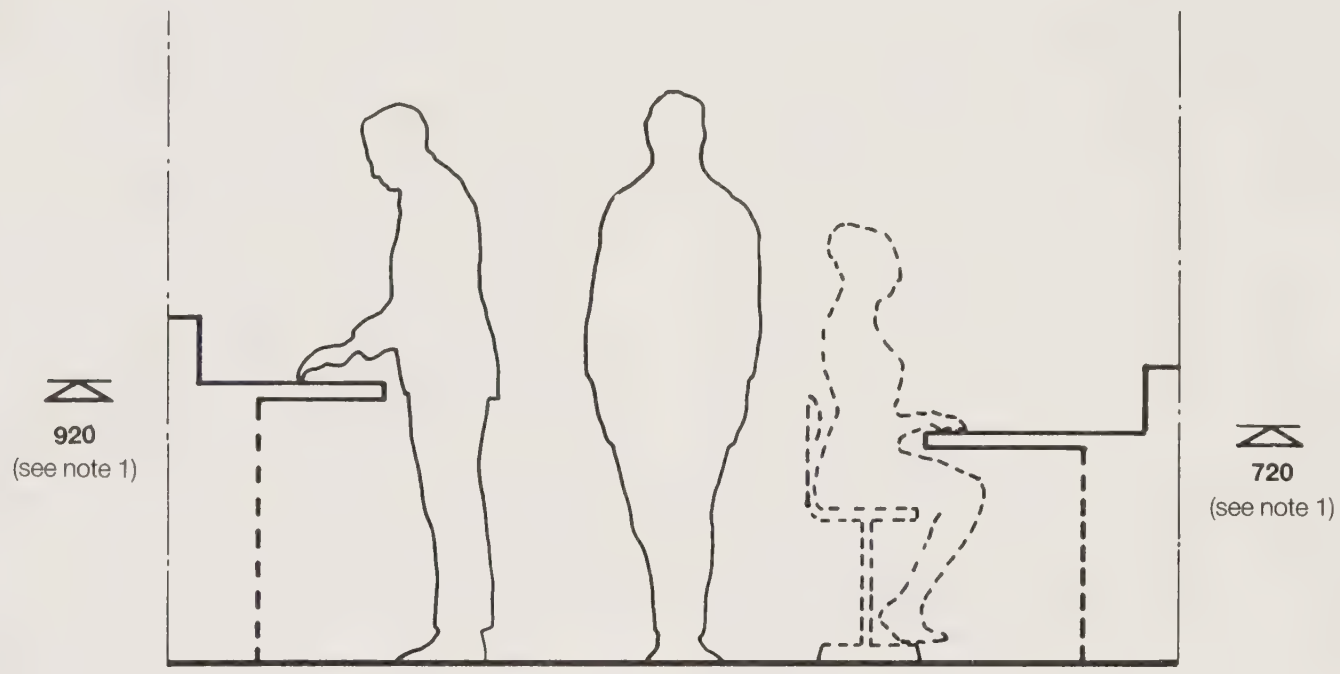
Activities:
General laboratory work.

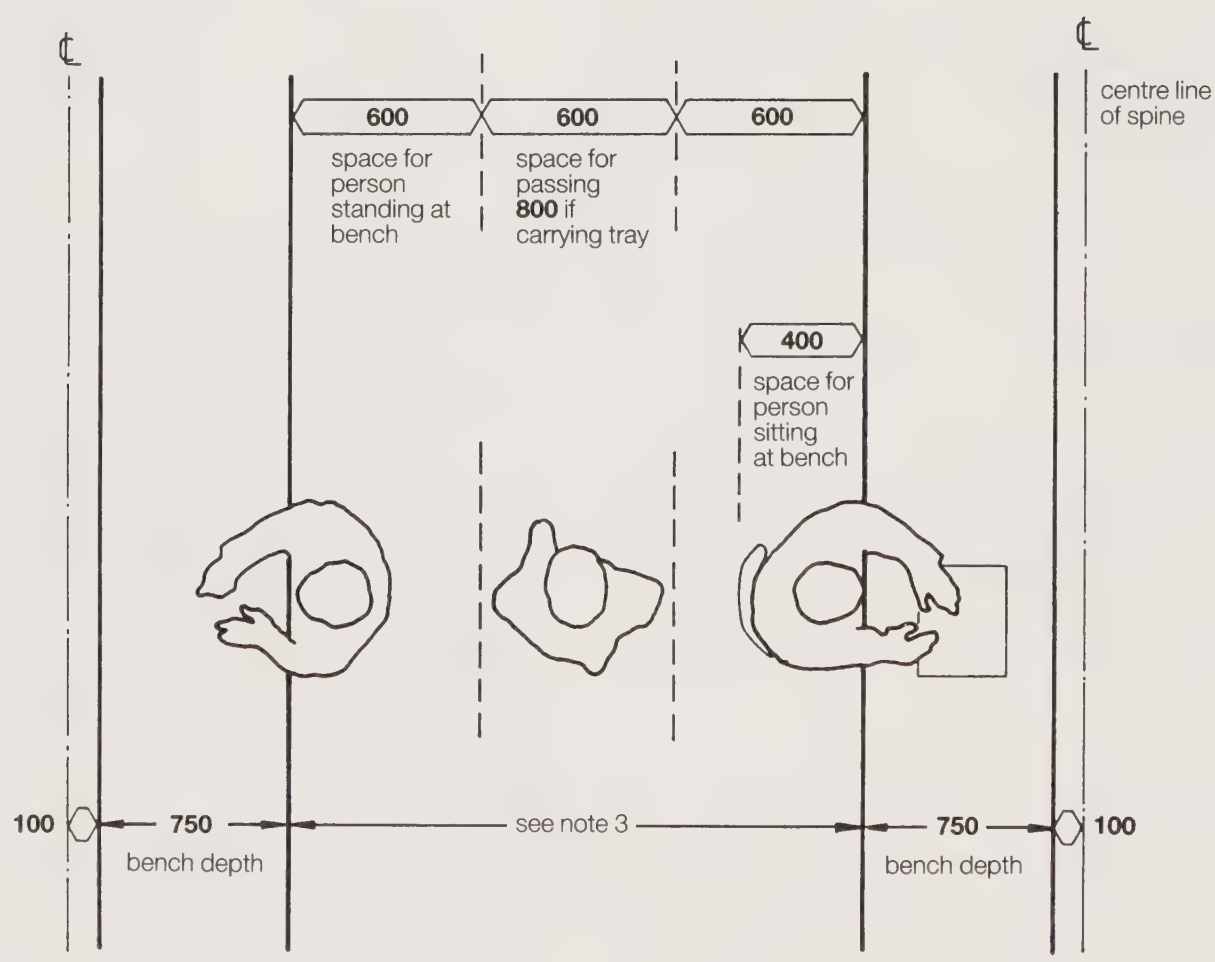
DH **Ergonomic Data Bank**
Component-User data sheet, not to scale

Laboratory bench

(Back to back working)

Users:
Laboratory staff





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42 Accommodation for education and training, 1989. HMSO*
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44 Accommodation for ambulance services (in preparation)
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